

NAVAL TECHNICAL TRAINING COMMAND

STUDENTS GUIDE
for
SH-2F AUTOMATIC STABILATION EQUIPMENT
ORGANIZATIONAL MAINTENANCE COURSE

SECTION I (INFORMATION SHEETS)
SECTION IV (DIAGRAMS)

C-602-3386



CNTT N6353D (6-81)

NAVAL AIR MAINTENANCE TRAINING GROUP

For Training Purposes Only

NAVAL AIR MAINTENANCE TRAINING GROUP

STUDENT'S GUIDE

FOR

SH-2F AUTOMATIC STABILIZATION EQUIPMENT
ORGANIZATION MAINTENANCE COURSE

C-602-3386

SECTION I (INFORMATION SHEETS)

SECTION IV (DIAGRAMS)

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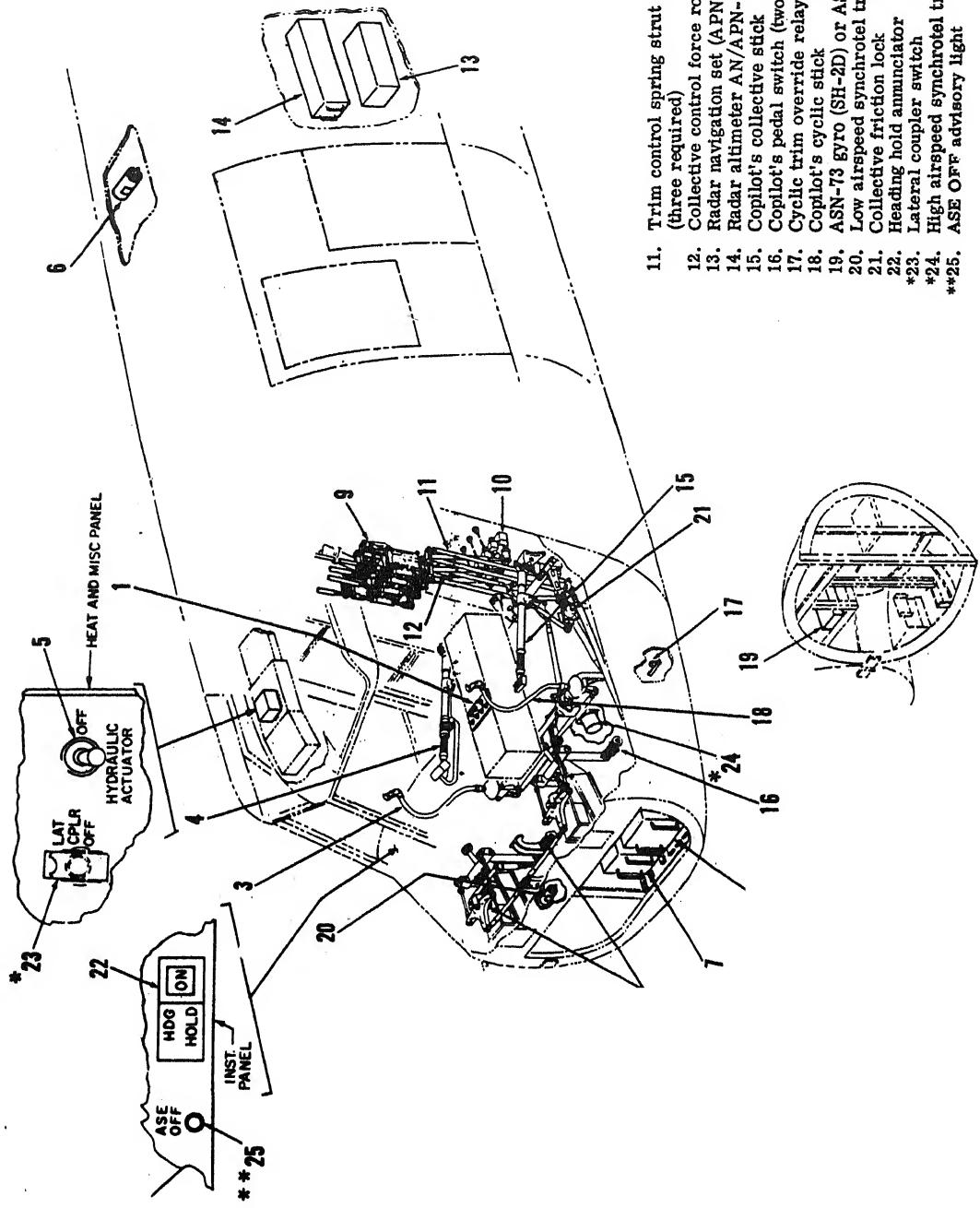
"Information sheets not in this course."

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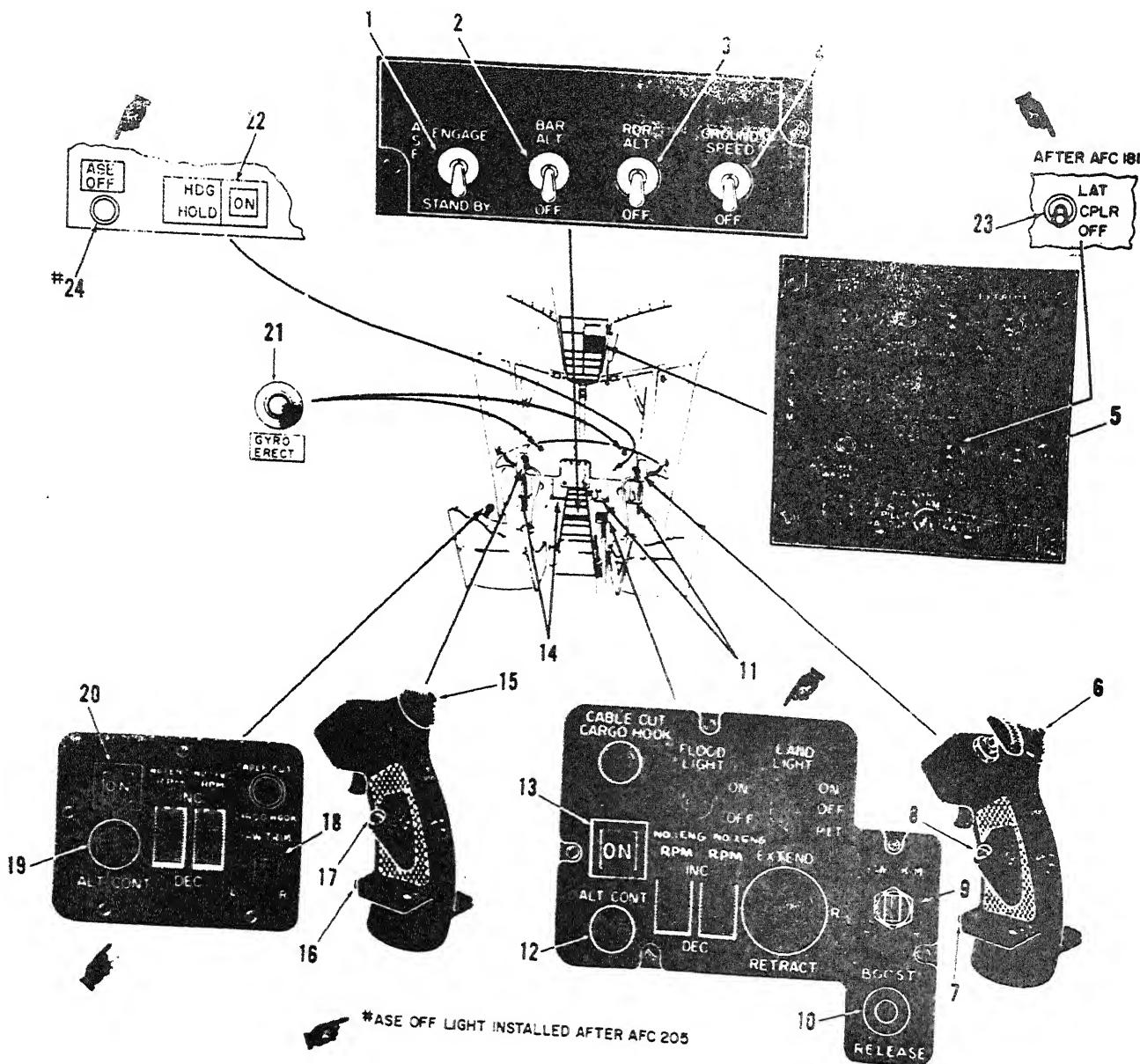
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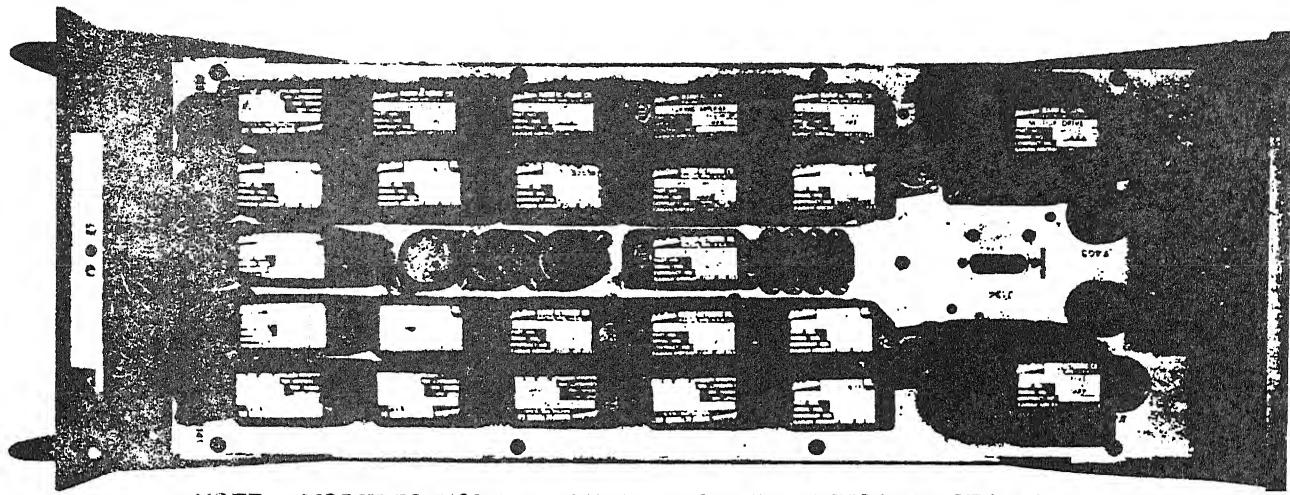


Component Location SH-2D/SH-2F



1. ASE control switch
2. Barometric altitude control switch
3. Radar altitude control switch
4. Groundspeed control switch
5. Hydraulic actuator switch
6. Pilot's cyclic trim switch
7. Pilot's ASE disengage button
8. Pilot's coordinated turn button
9. Pilot's yaw trim switch
10. Boost release switch
11. Pilot's heading disengage switches
12. Pilot's altitude control button
13. Pilot's altitude control annunciator
14. Copilot's heading disengage switches
15. Copilot's cyclic trim switch
16. Copilot's ASE disengage button
17. Copilot's coordinated turn button
18. Copilot's yaw trim switch
19. Copilot's altitude control button
20. Copilot's altitude control annunciator
21. Gyro quick-erect button
22. Heading hold annunciator
23. Lateral coupler switch
24. ASE - OFF light (After AFC 205)

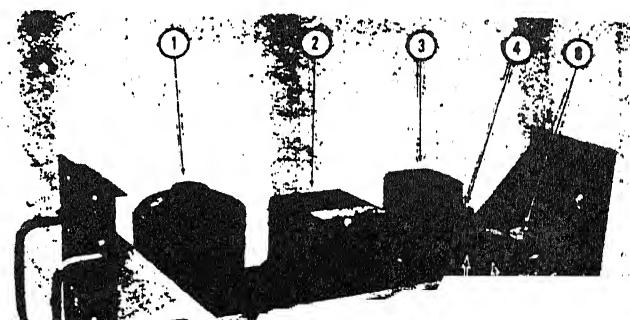
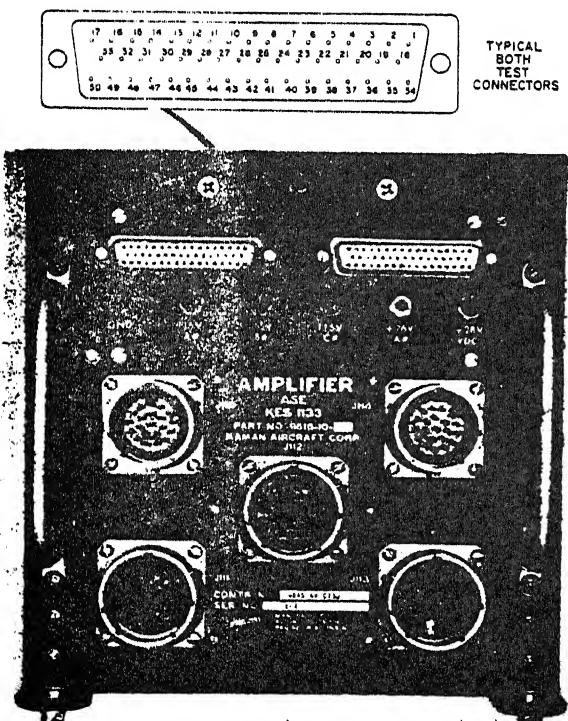
ASE - Operating Controls



NOTE: MODULES J120 AND J140 ARE NOT HERMETICALLY SEALED IN THE STABILIZATION AMPLIFIER. SEE FIGURES 2-42 AND 2-44.

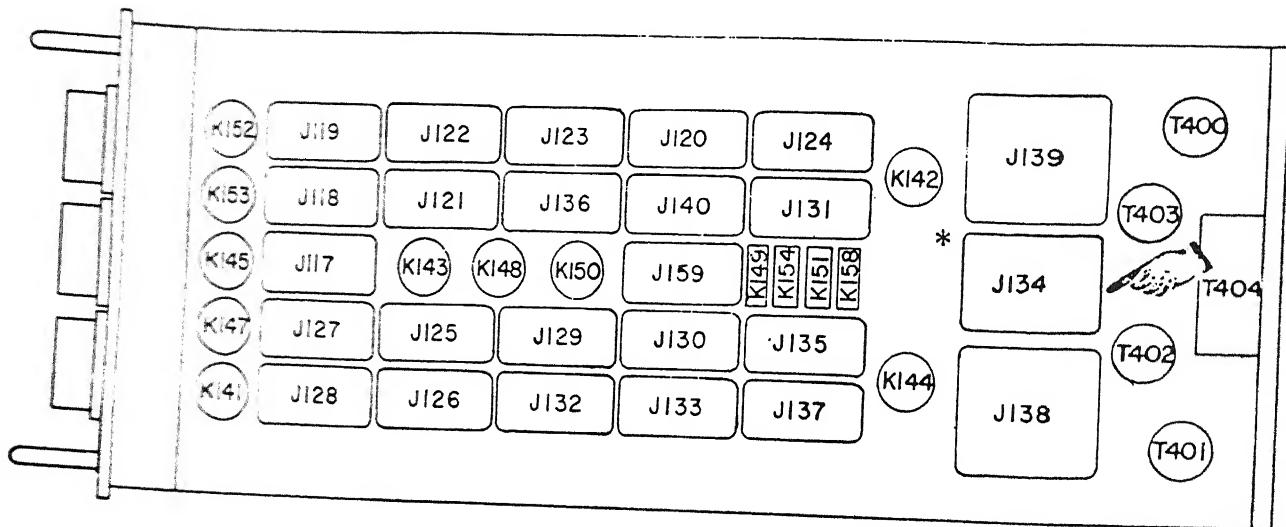
*MODULE J134 ADDED TO ASE AMPLIFIERS INC. AFC 181 (101 ROTOR SYSTEM). THIS MODULE IS NOT HERMETICALLY SEALED (REFER TO FIGURE 2-44A).

Stabilization Amplifier - Cover Removed



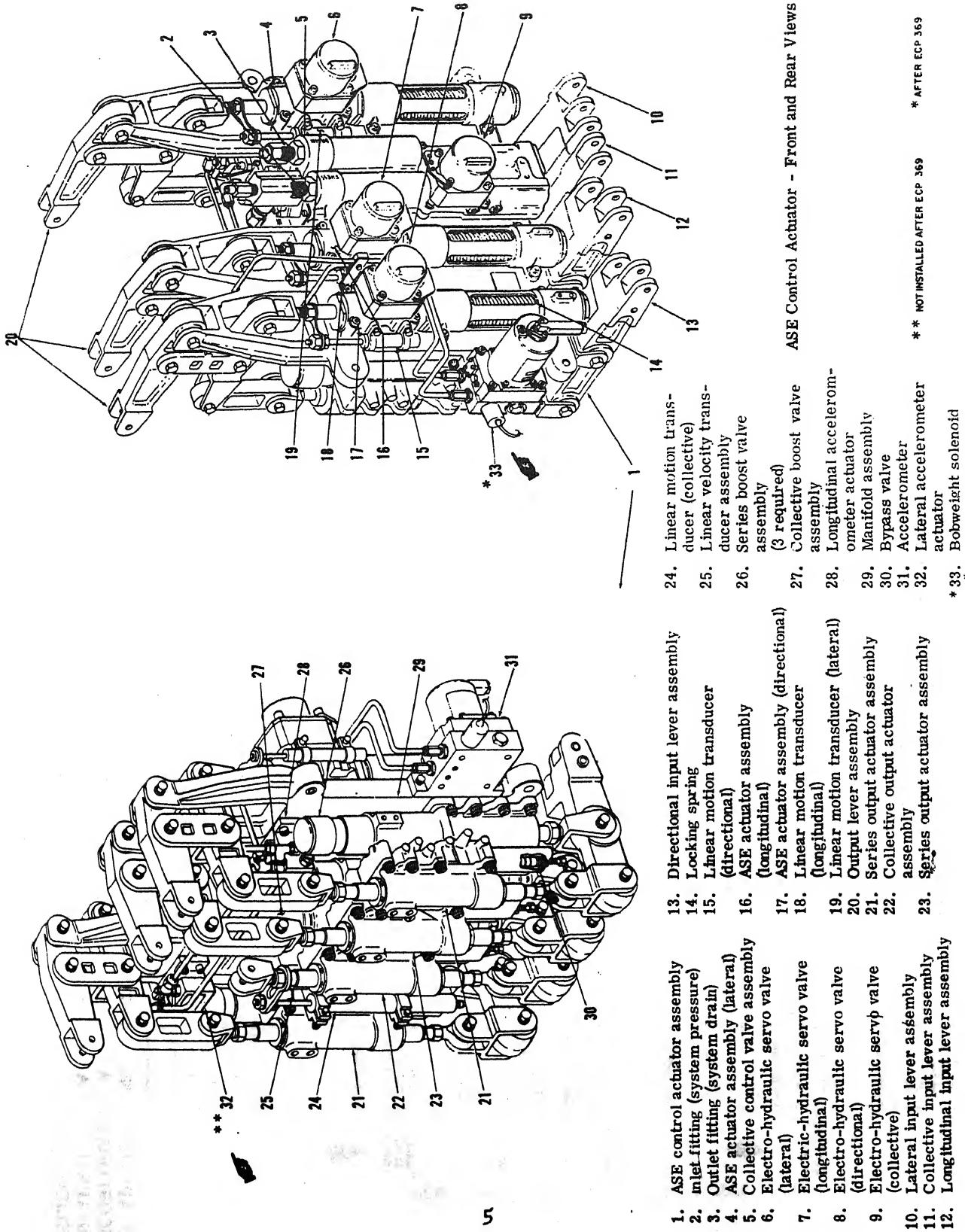
Stabilization Amplifier - Front Panel

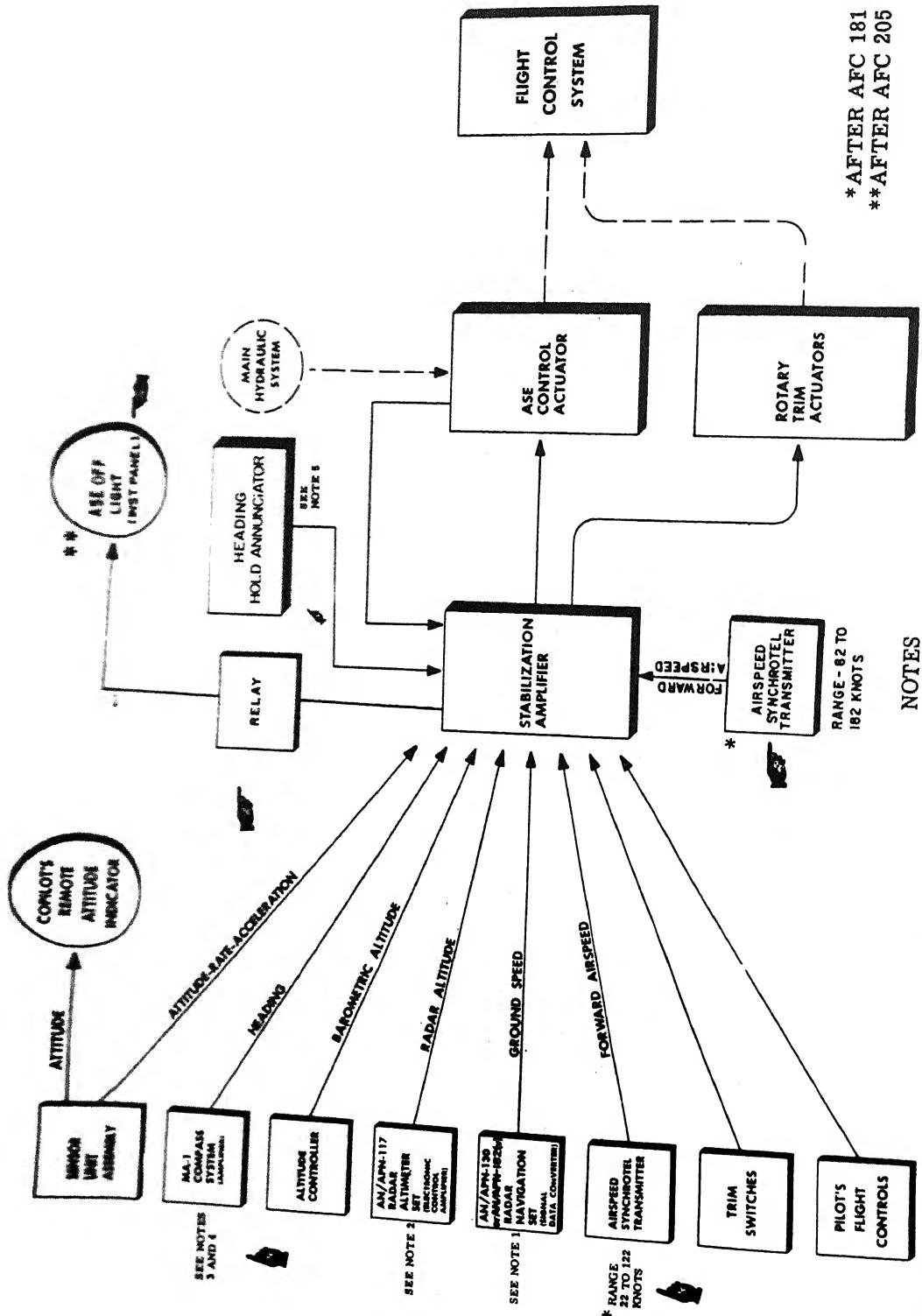
Stabilization Amplifier - Component Identification



Key

J117	BAR ALT synchronizer amplifier (for altitude controller)	J131	Demodulator amplifier (roll)	K145	BAR ALT control relay
J118	BAR ALT synchronizer amplifier	J132	Synchronizer (roll)	K147	RDR ALT control relay
J119	BAR ALT synchronizer	J133	Synchronizer (roll groundspeed)	K148	Pitch groundspeed relay
J120	Summing network (pitch -collective)	*J134	Lateral collective coupler network	K149	RDR ALT reliability relay
J121	RDR ALT synchronizer amplifier	J135	Synchronizer amplifier (heading)	K150	Roll groundspeed relay
J122	RDR ALT synchronizer	J136	Demodulator amplifier (heading)	K151	Power interlock relay
J123	Demodulator amplifier (collective)	J137	Synchronizer (heading)	K152	Power relay
J124	Demodulator amplifier (pitch)	J138	Motor drive amplifier (heading)	K153	Automatic coordinated turn relay
J125	Synchronizer amplifier (pitch)	J139	Motor drive amplifier (pitch)	K154	RDR ALT control relay
J126	Synchronizer (pitch)	J140	Summing network (roll-heading)	K158	Pedal force relay
J127	Synchronizer amplifier (pitch groundspeed)	J159	Relay driver (yaw rate)	T400	Transformer, phase-reversal
J128	Synchronizer (pitch groundspeed)	K141	Heading engage relay	T401	Transformer, stepdown
J129	Synchronizer amplifier (roll)	K142	Pitch attitude engage relay	K402	Transformer, stepdown
J130	Synchronizer amplifier (roll groundspeed)	K143	Roll attitude engage relay	T403	Transformer stepdown
		K144	Automatic pedal trim relay	T404	Transformer, power

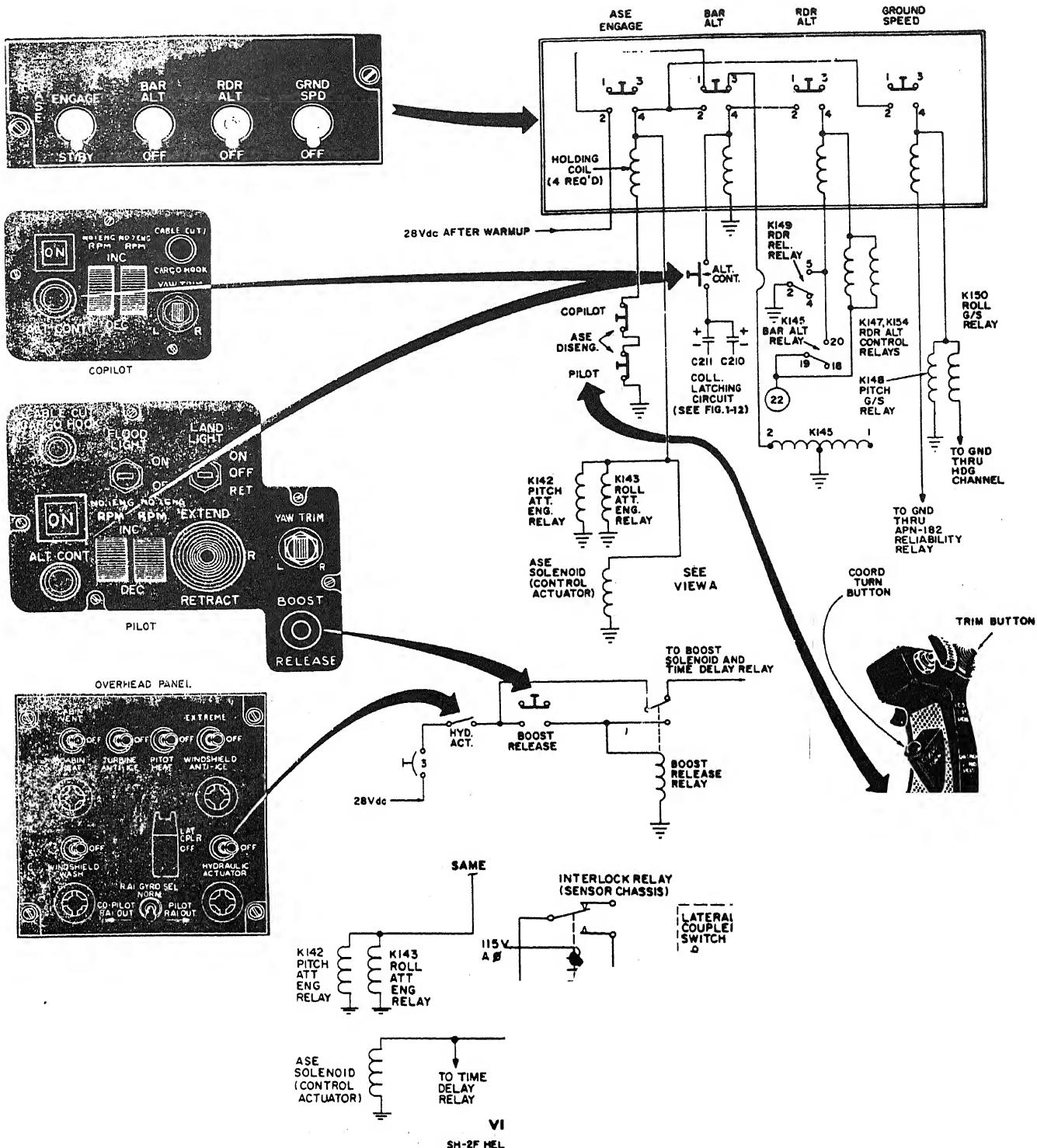




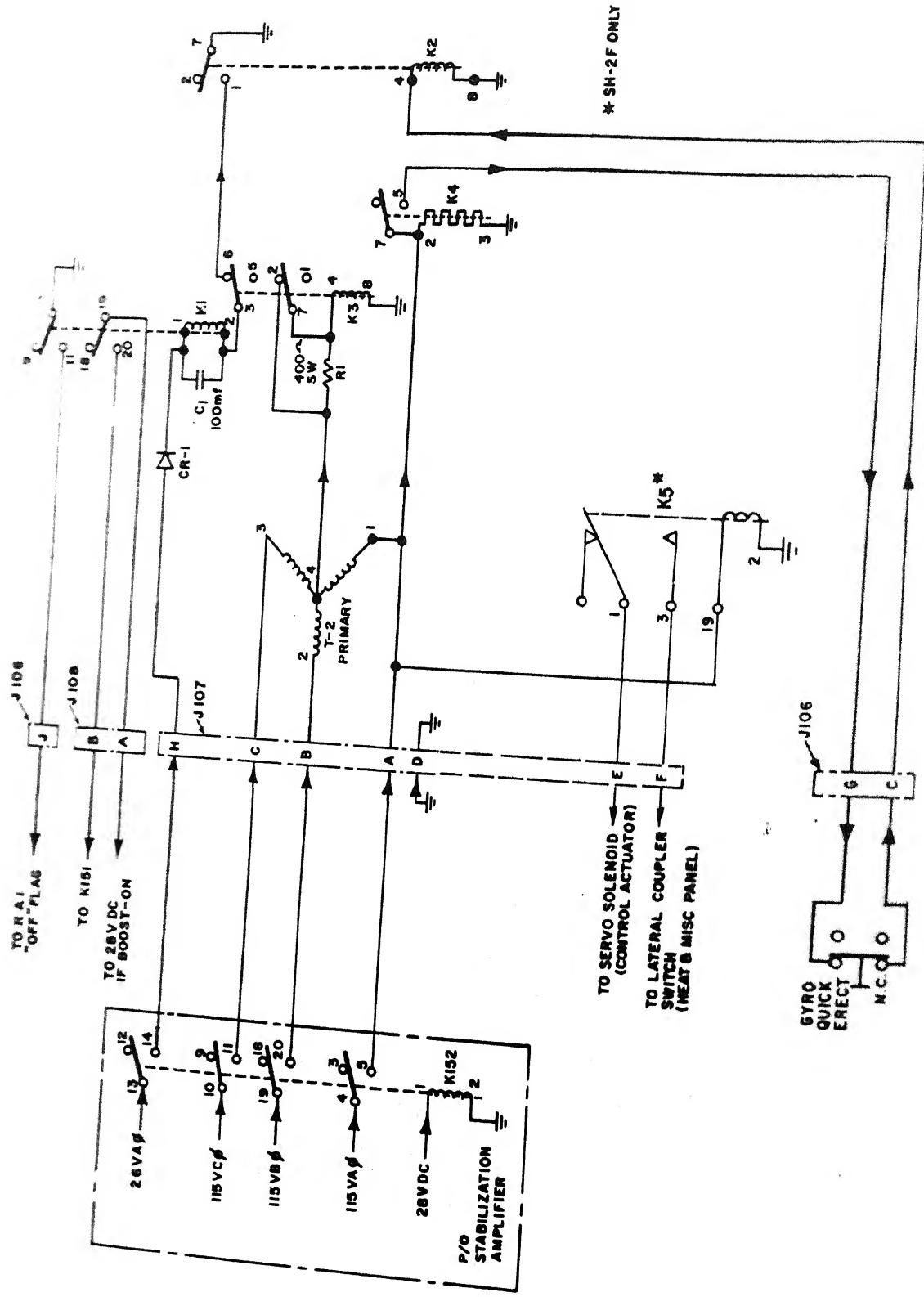
1. AN/APN-182(V) INSTALLED IN SH-2D/SH-2F AND AIRCRAFT INCORPORATING AFC 179 OR AFC 179A1
2. AN/APN-171 RADAR ALTIMETER USED IN SH-2D/SH-2F HELICOPTERS

4. AN/ASN-50 ATTITUDE-HEADING SYSTEM USED IN SH-2F HELICOPTERS

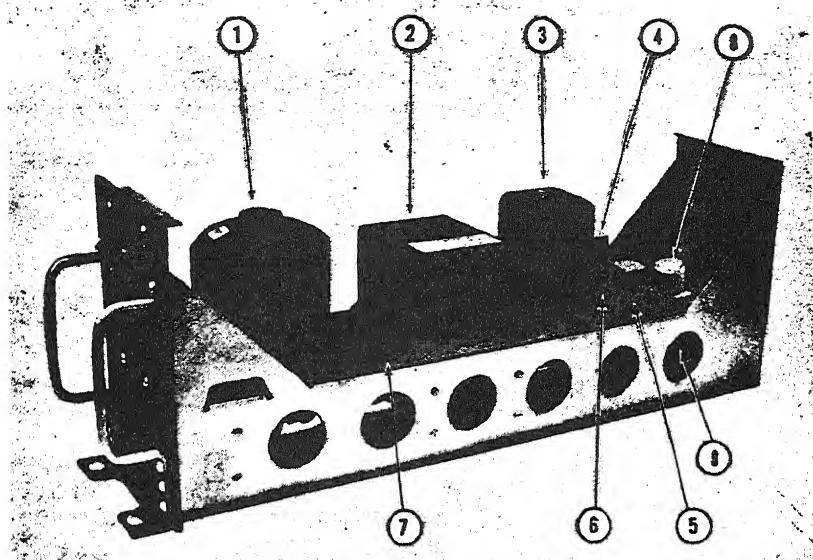
5. HEADING HOLD ANNUNCIATOR INSTALLED IN SH-2D/SH-2F ONLY.



ASE - C



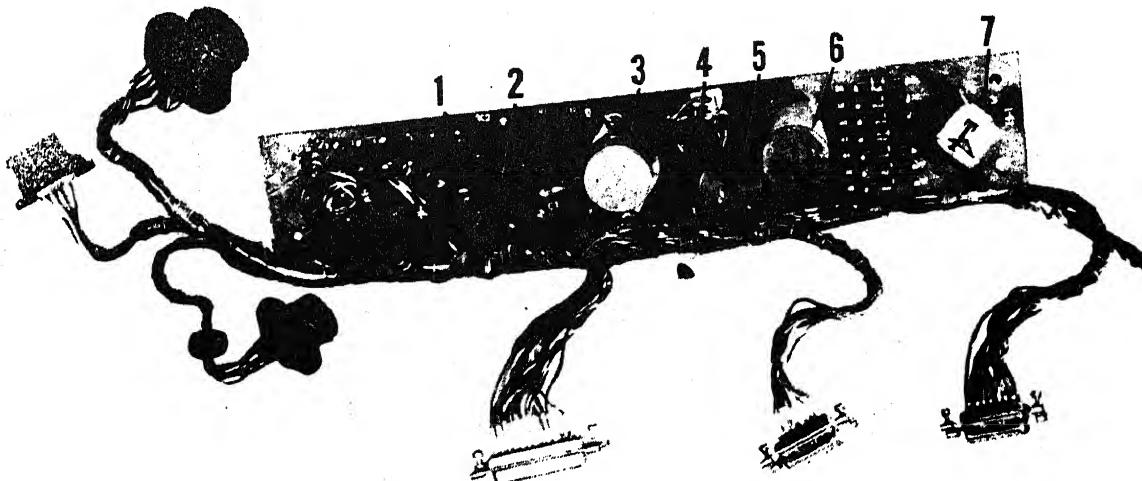
Time Delay and Power Interlock Circuit



262-1294

1. Vertical gyro	6. Potentiometer
2. Rate gyro package	7. Deck plate assembly
3. Accelerometer unit	8. Coupler interlock relay
4. Magnetic modulator	9. Roll rate filter circuit board
5. Transformer	assembly

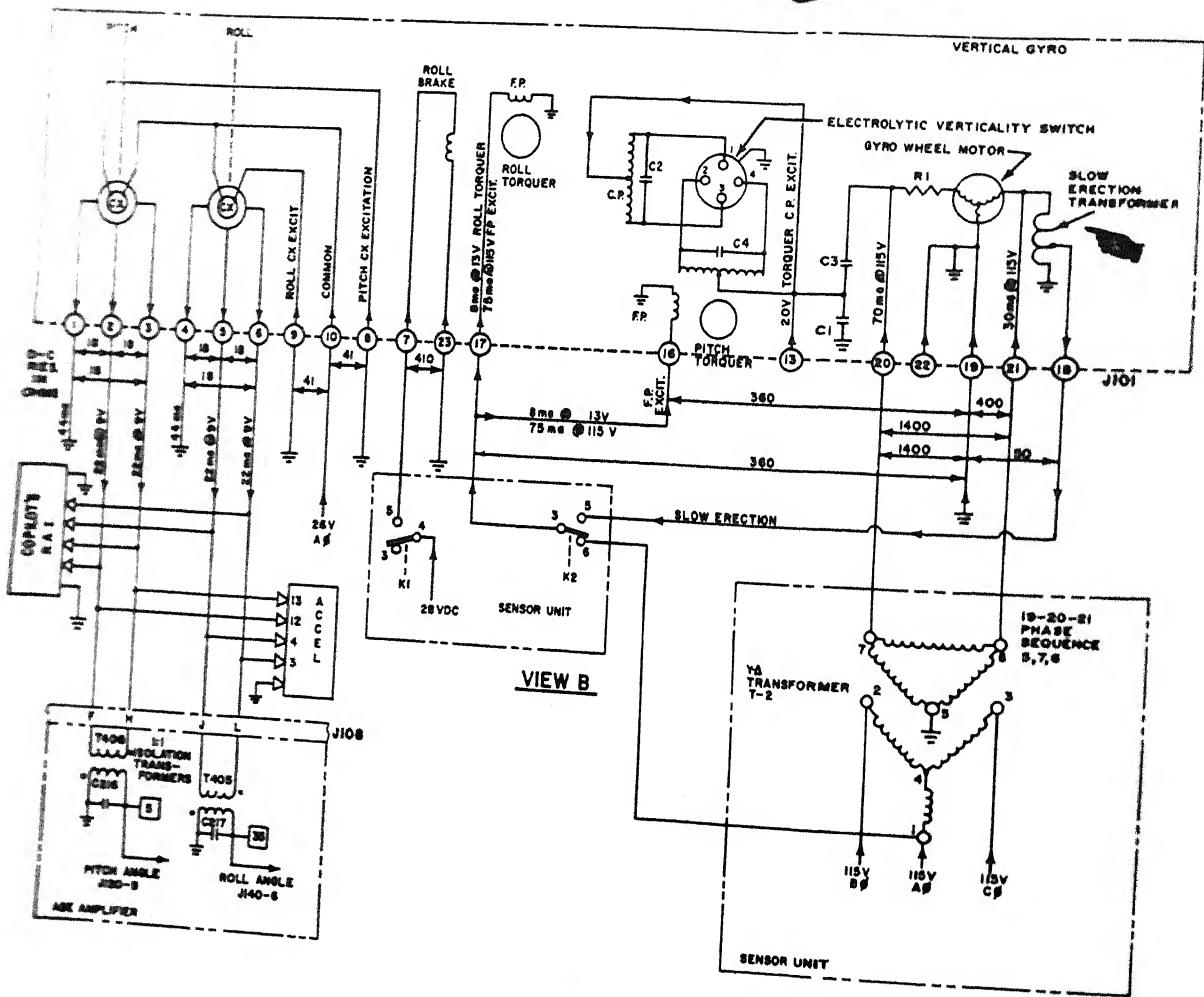
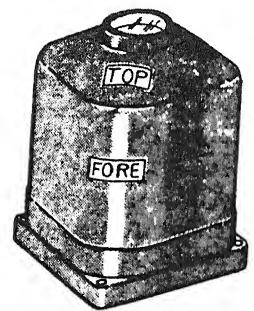
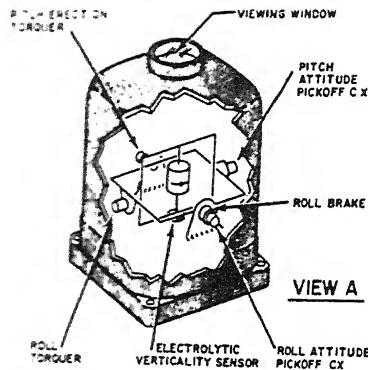
Sensor Unit Assembly - Major Components



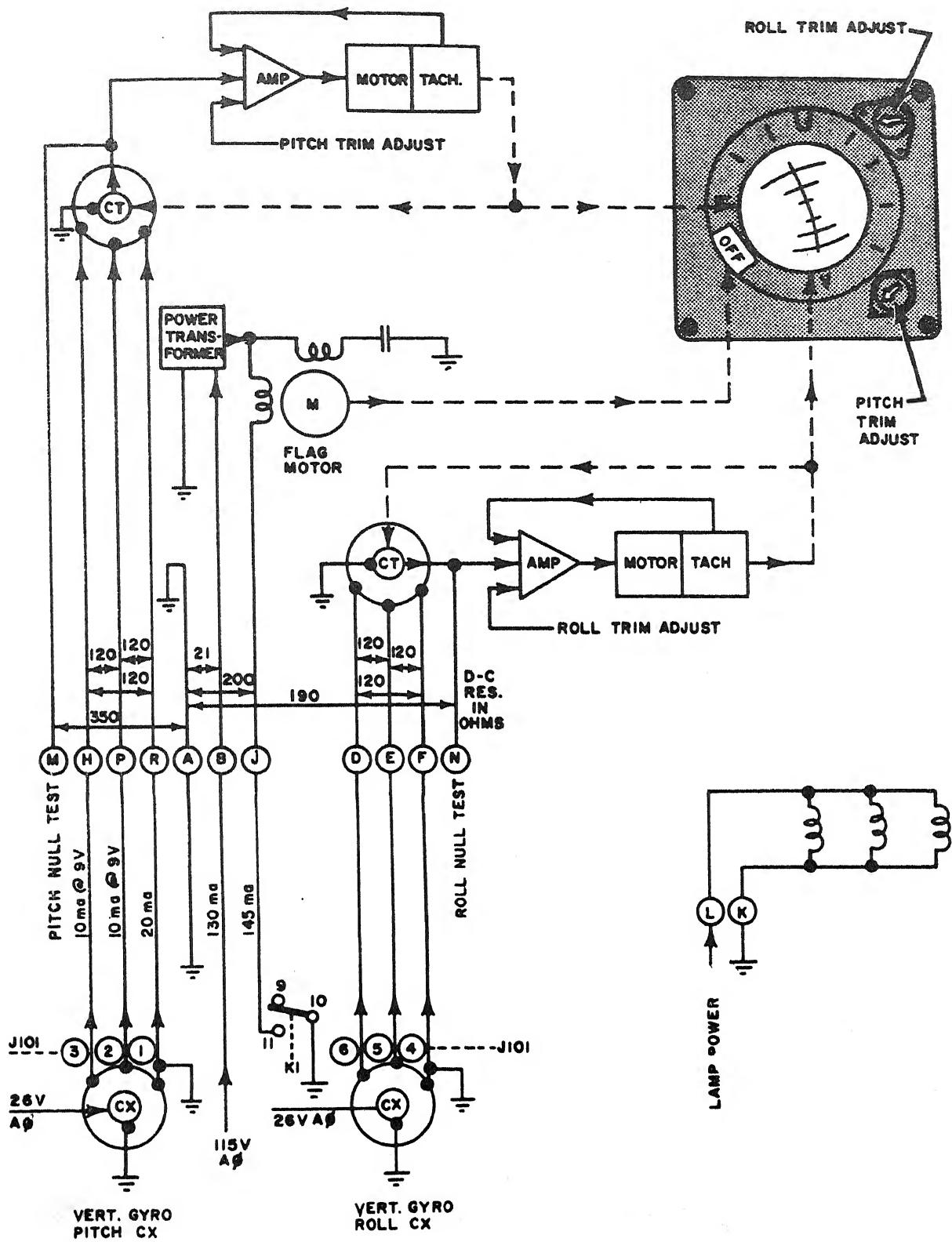
262-1295

1. Relay K2	5. Transformer T1
2. Relay K3	6. Transformer T2
3. Relay K1	7. Transformer T3
4. Relay K4	

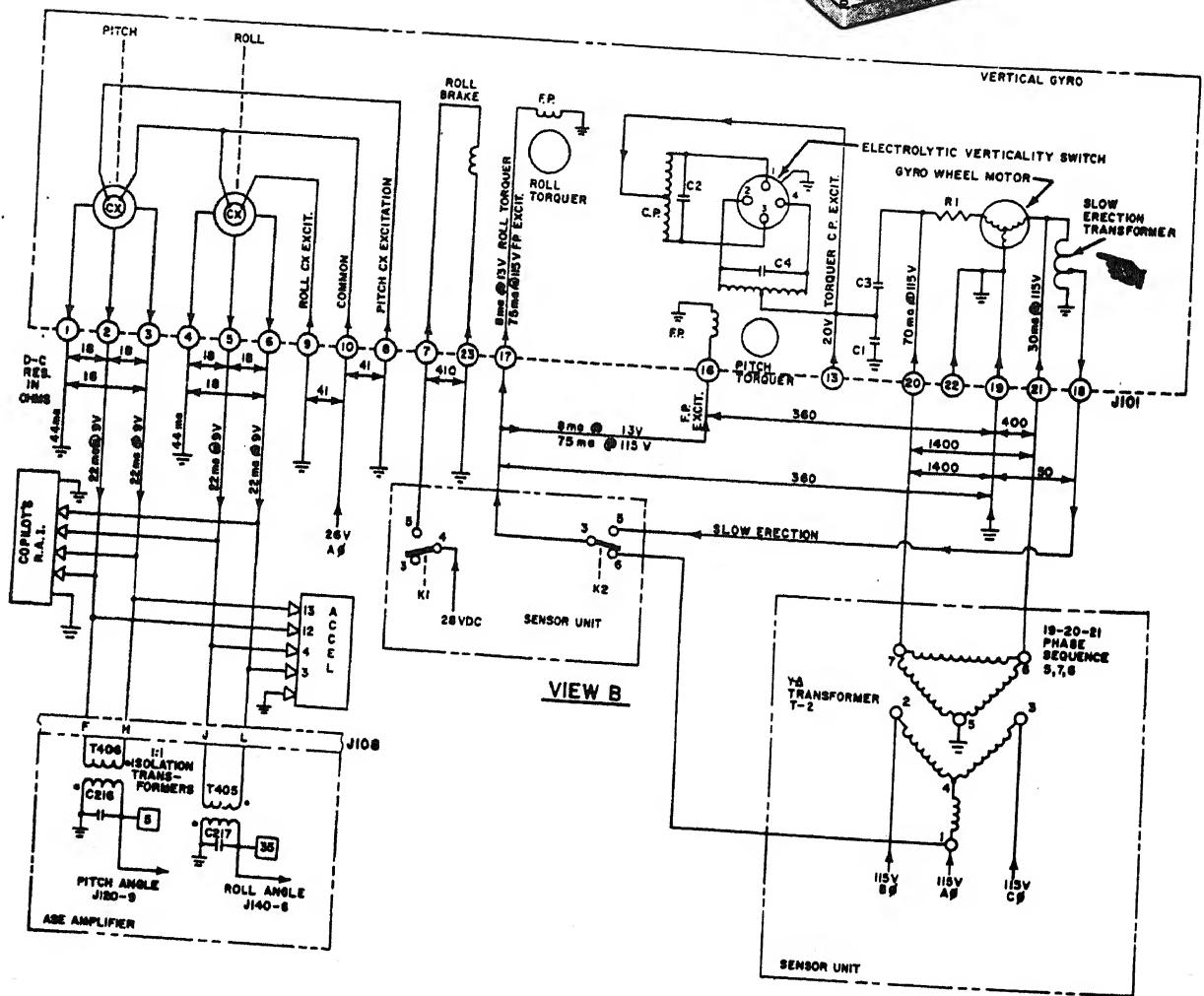
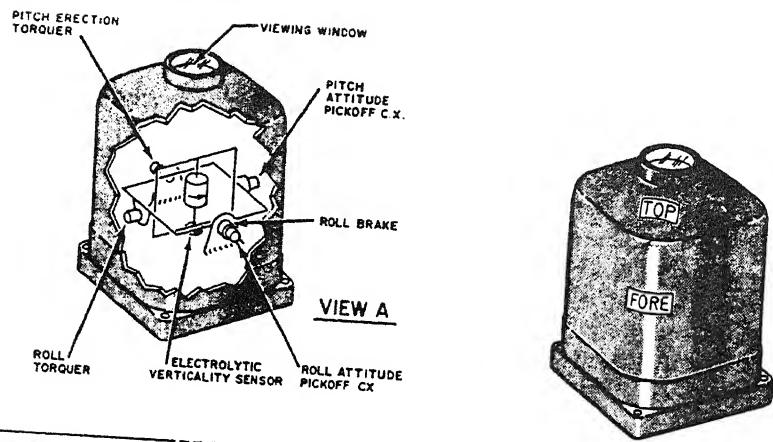
Sensor Unit Sub-Chassis Assembly



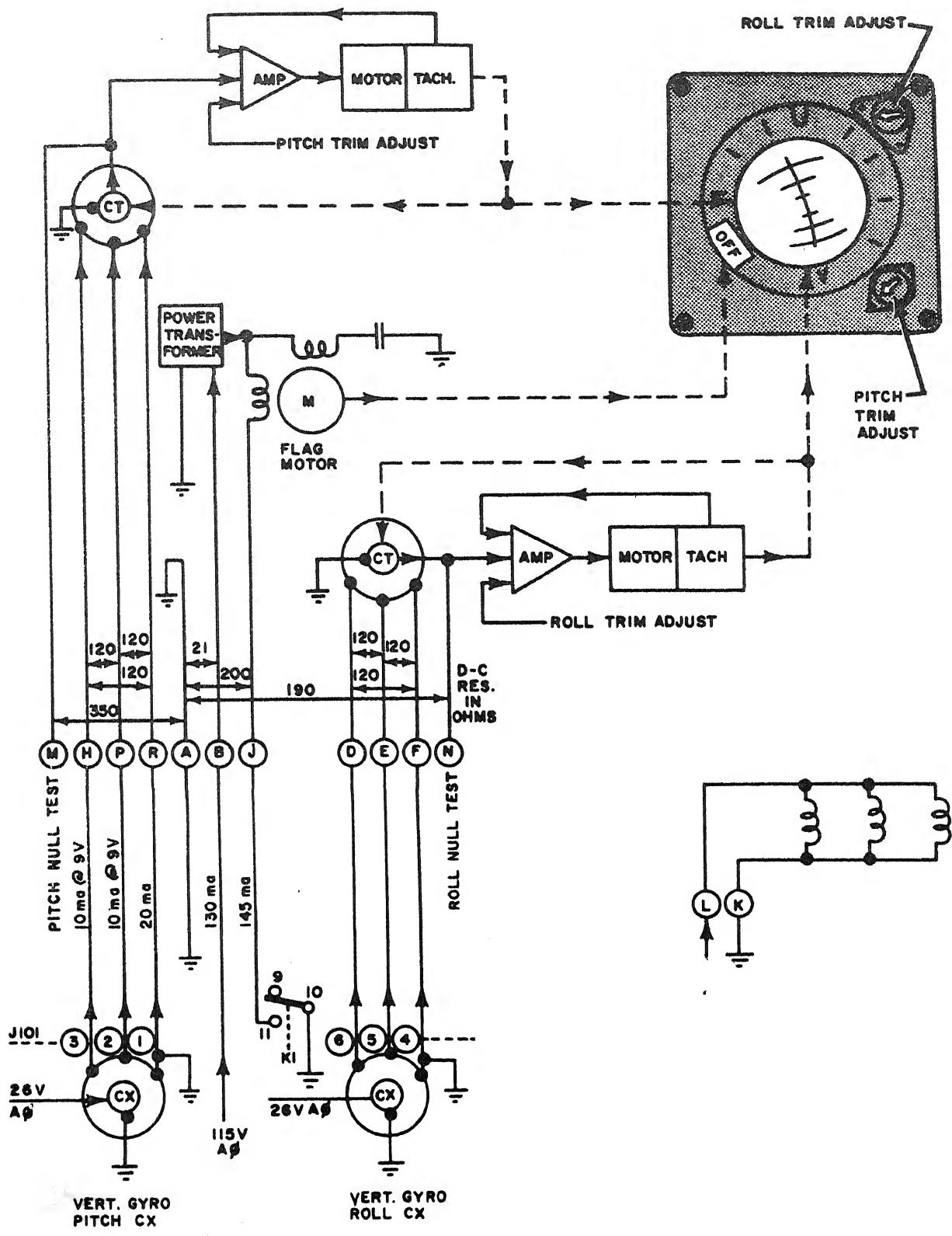
Vertical Gyro



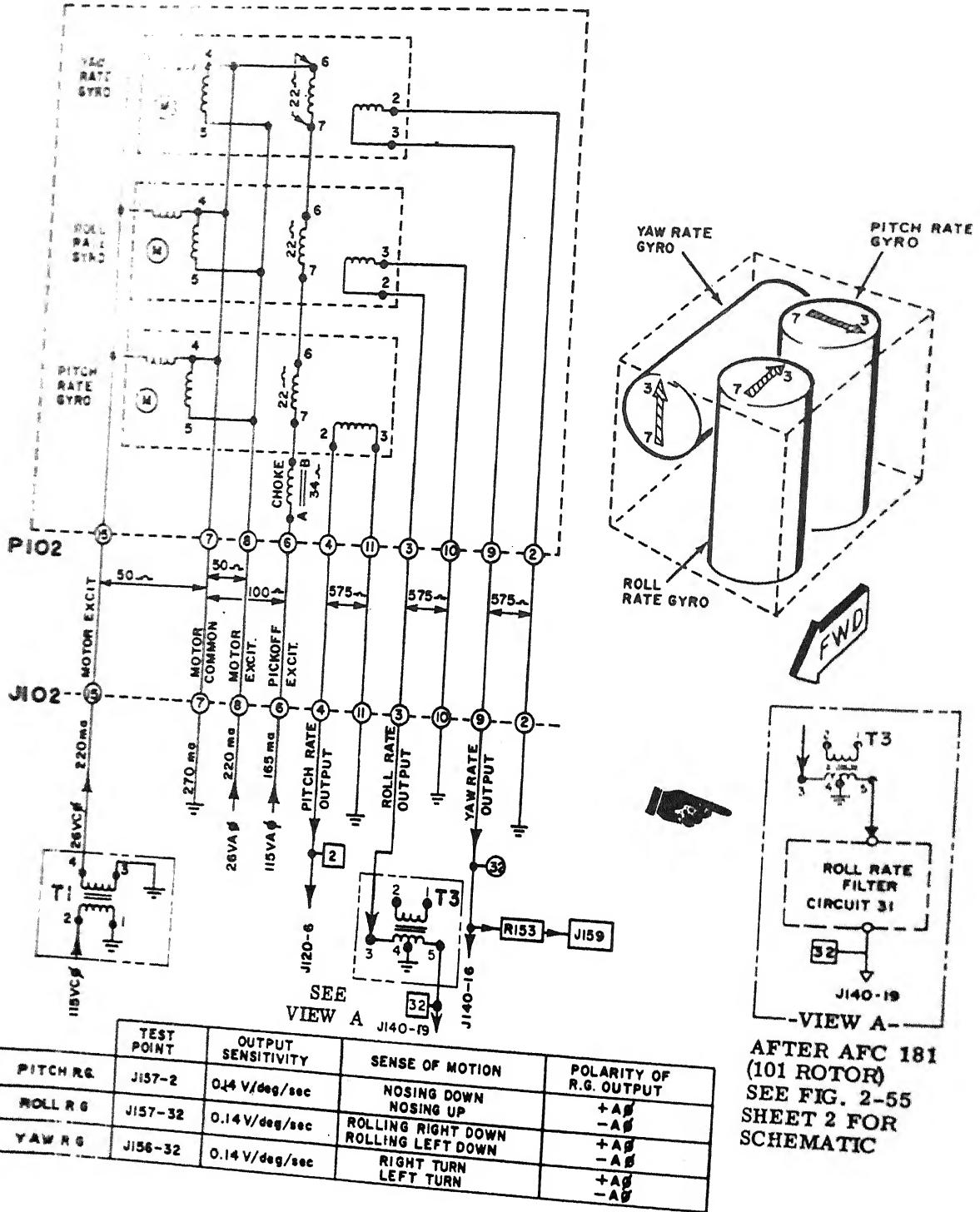
Copilot's Remote Attitude Indicator



Vertical Gyro

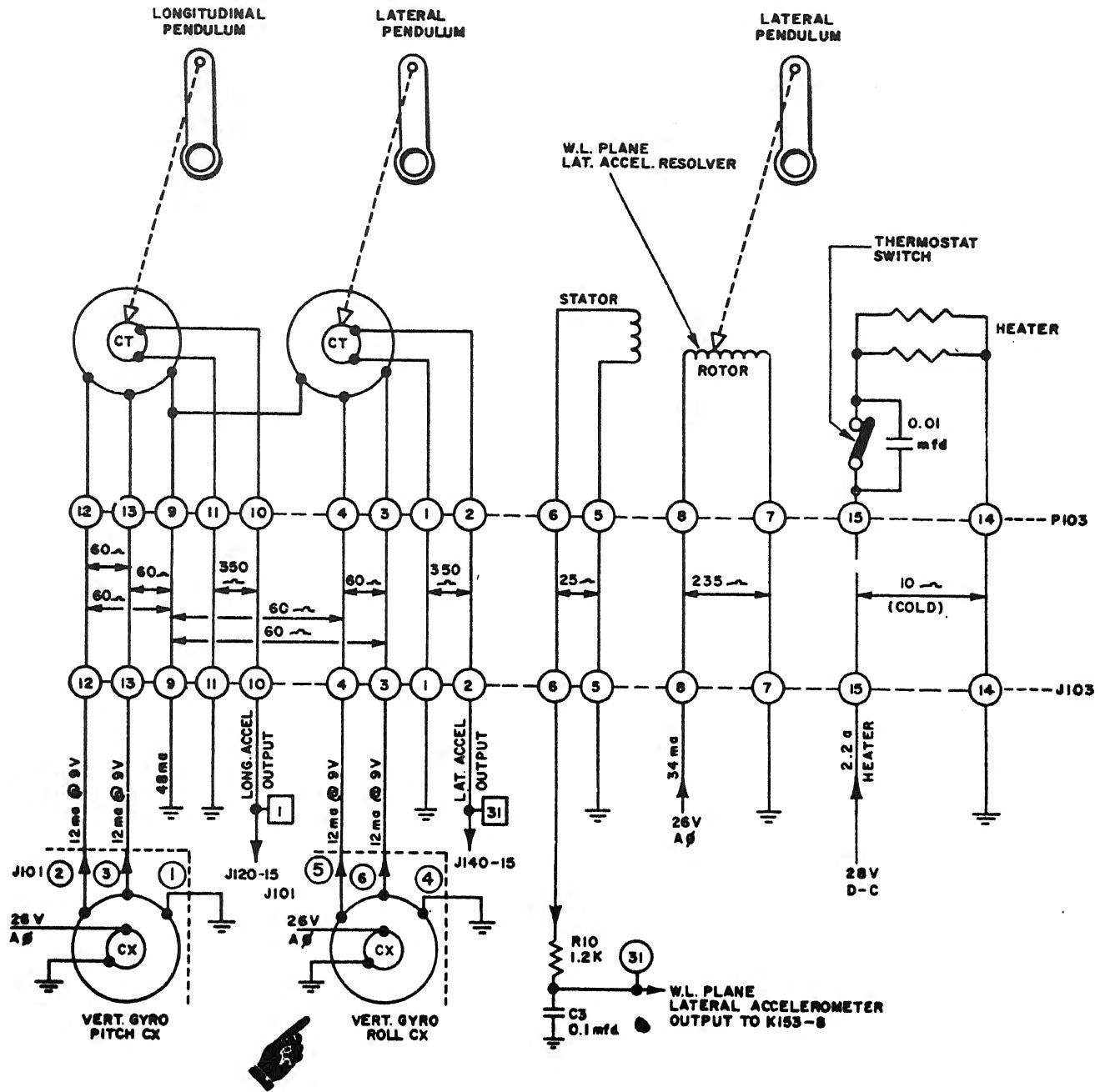


Copilot's



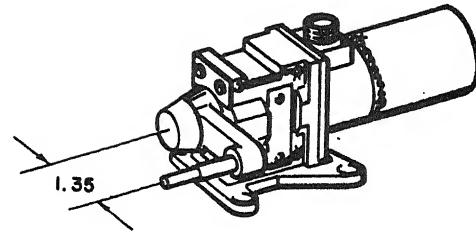
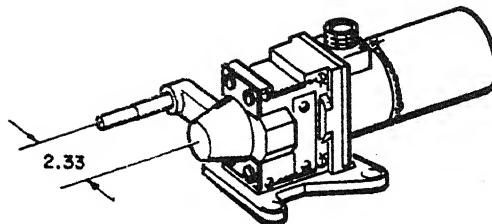
AFTER AFC 181
(101 ROTOR)
SEE FIG. 2-55
SHEET 2 FOR
SCHEMATIC

Rate Gyro



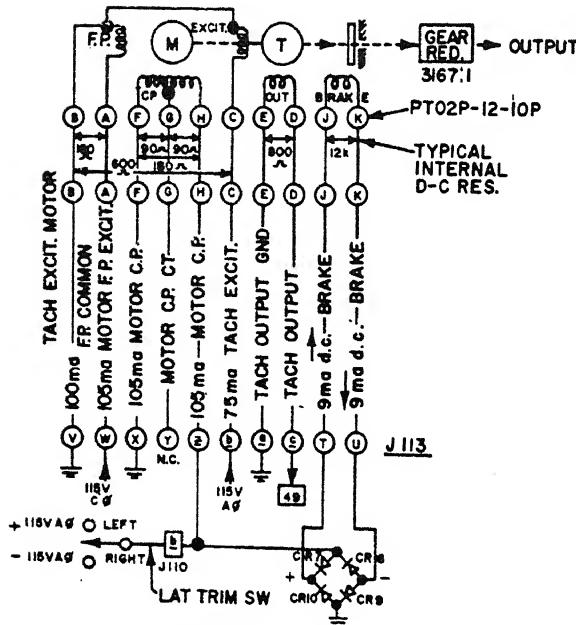
TEST POINT	SENSITIVITY	POLARITY OF OUTPUT
LONGITUDINAL ACCELEROMETER	J157-1	360 mv/deg = 640 mv/ft/sec/sec
LATERAL ACCELEROMETER	J157-31	360 mv/deg = 640 mv/ft/sec/sec
LATERAL W.L. PLANE ACCEL.	J156-31	190 mv/deg = 340 mv/ft/sec/sec

Accelerometer



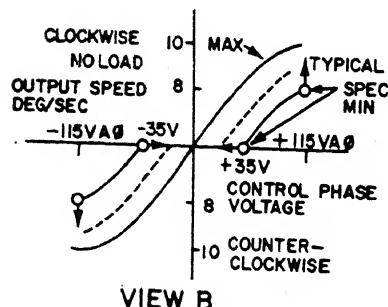
DIRECTIONAL

LATERAL &
LONGITUDINAL

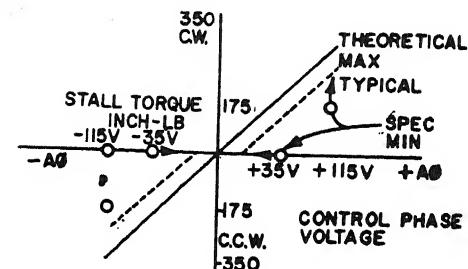


VIEW A

TRIM CIRCUITS

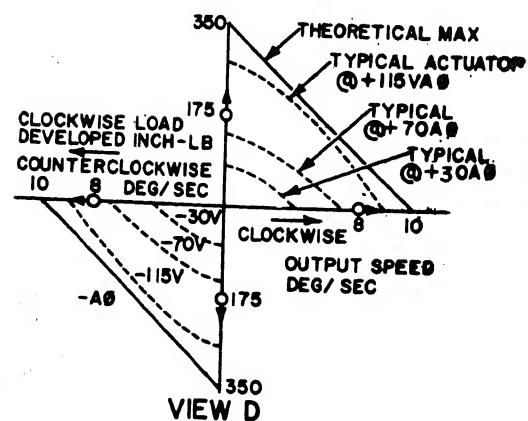


NO LOAD SPEED VS. CONTROL
PHASE VOLTAGE AT RATED
(115V) F.P. VOLTAGE



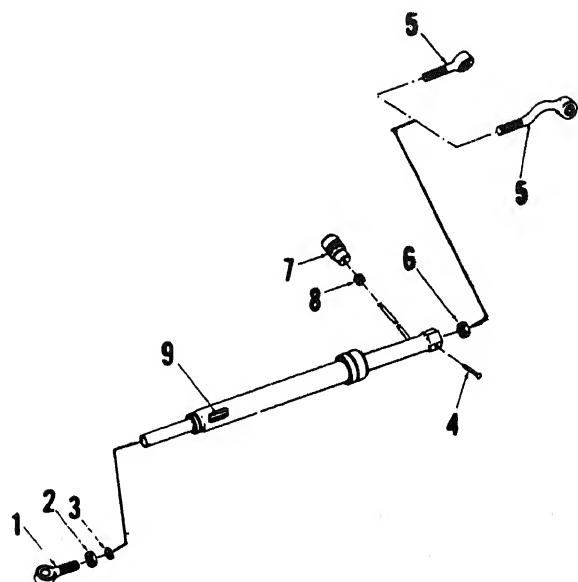
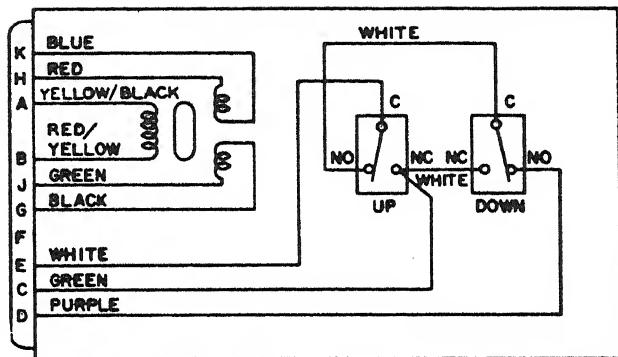
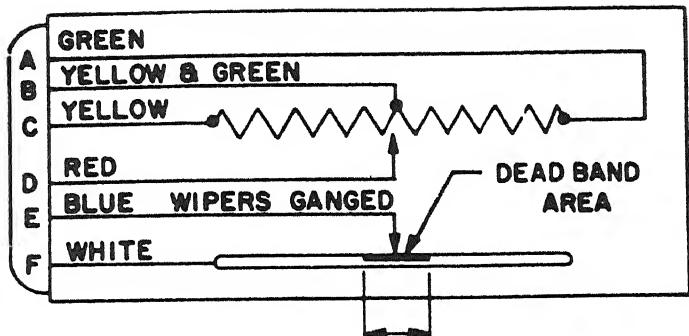
VIEW C

STALL TORQUE VS. CONTROL
PHASE VOLTAGE AT RATED
(115V) F.P. VOLTAGE



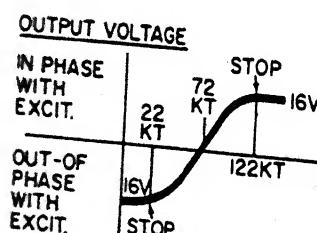
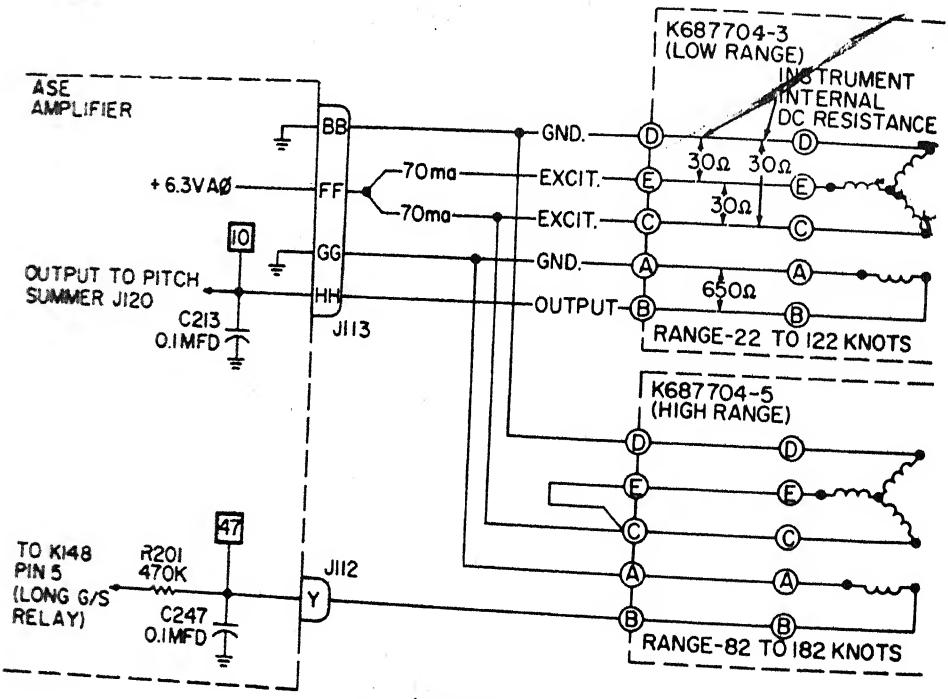
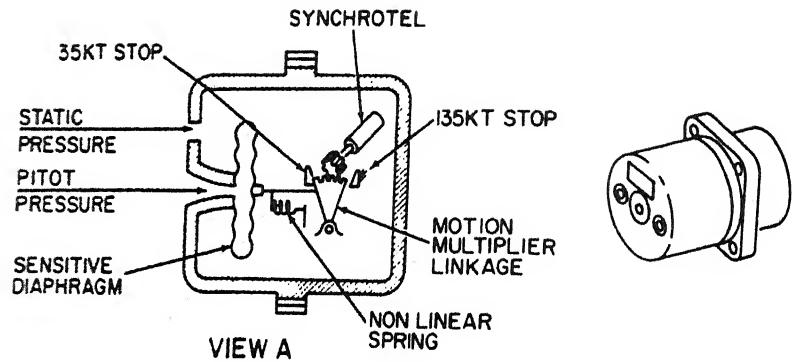
TORQUE VS. SPEED AT RATED
F.P. (115V) AND VARIABLE C.P. VOLTAGE

Rotary Trim Actuators

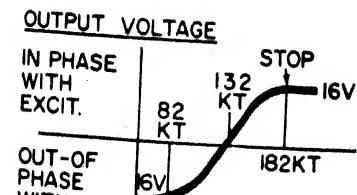


1. Rodend
2. Nut
3. Key washer
4. Rivet
5. Rodend
6. Nut
7. Connector plug
8. Grommet
9. Potentiometer

Trim Control Spring Strut Assembly

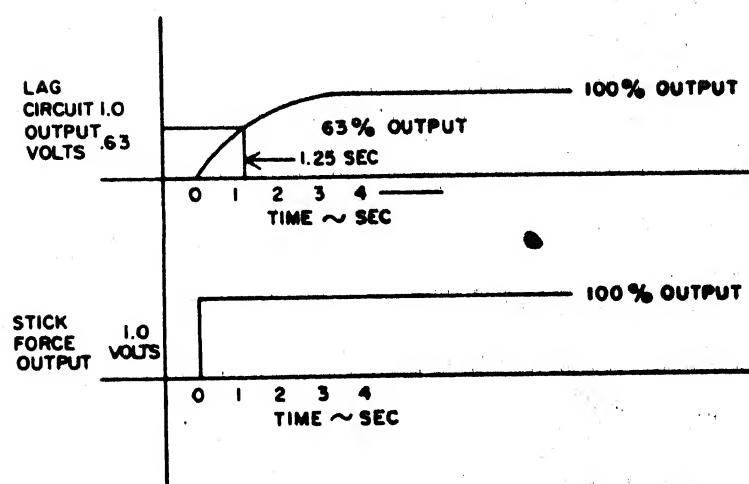
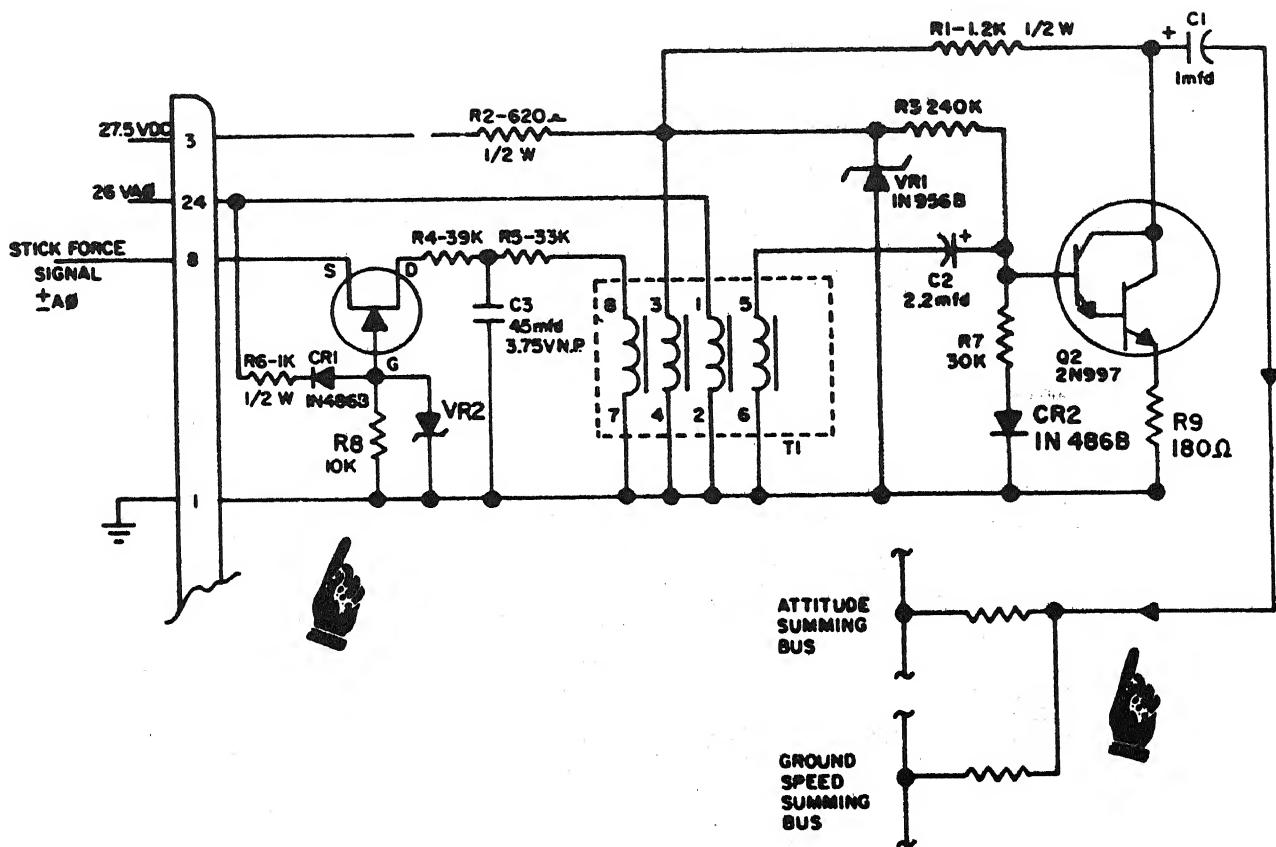


TEST POINT ON
AMPLIFIER
TEST RECEPTACLE J157

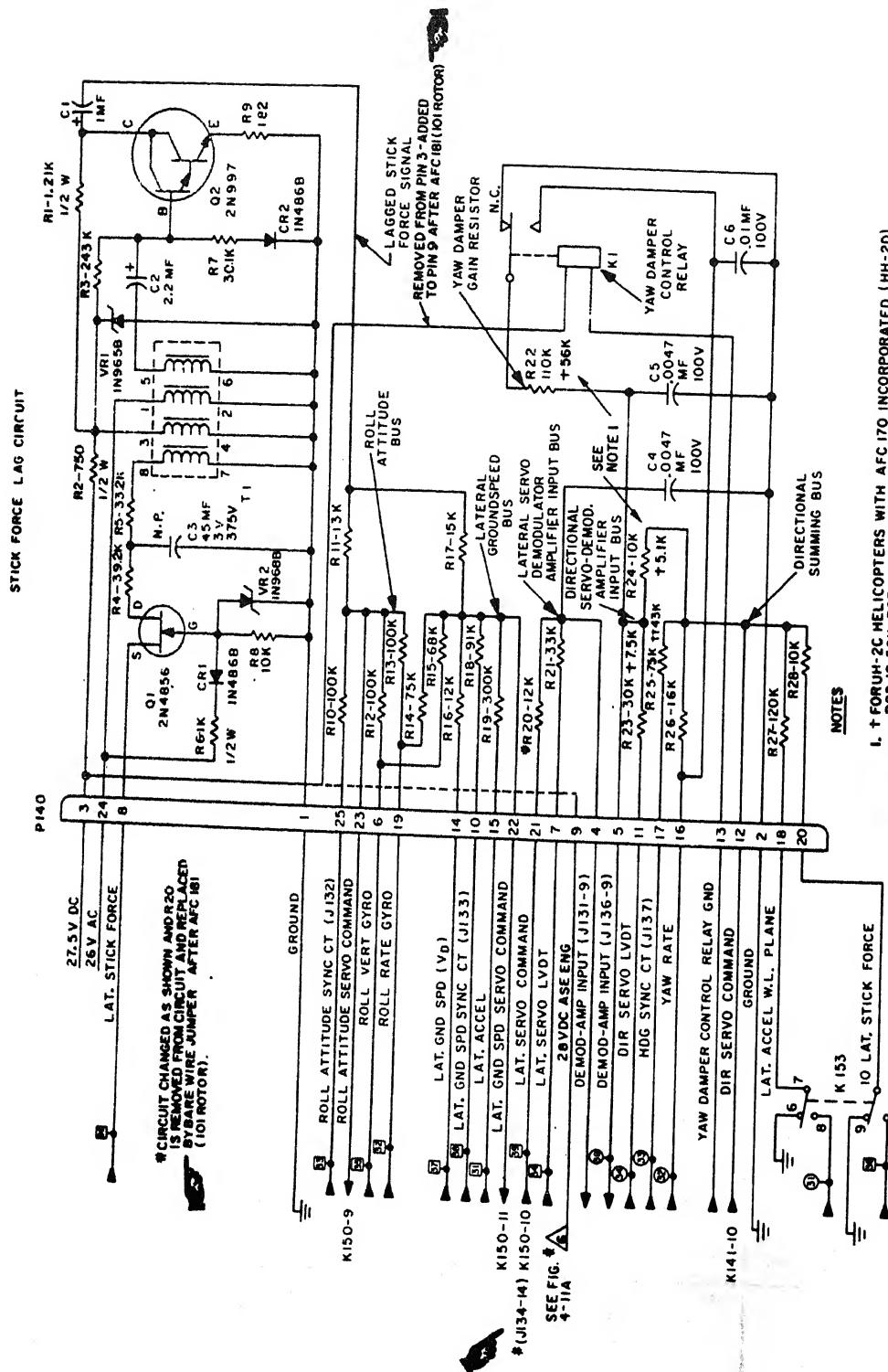


AFTER AFC 181 (101 ROTOR)

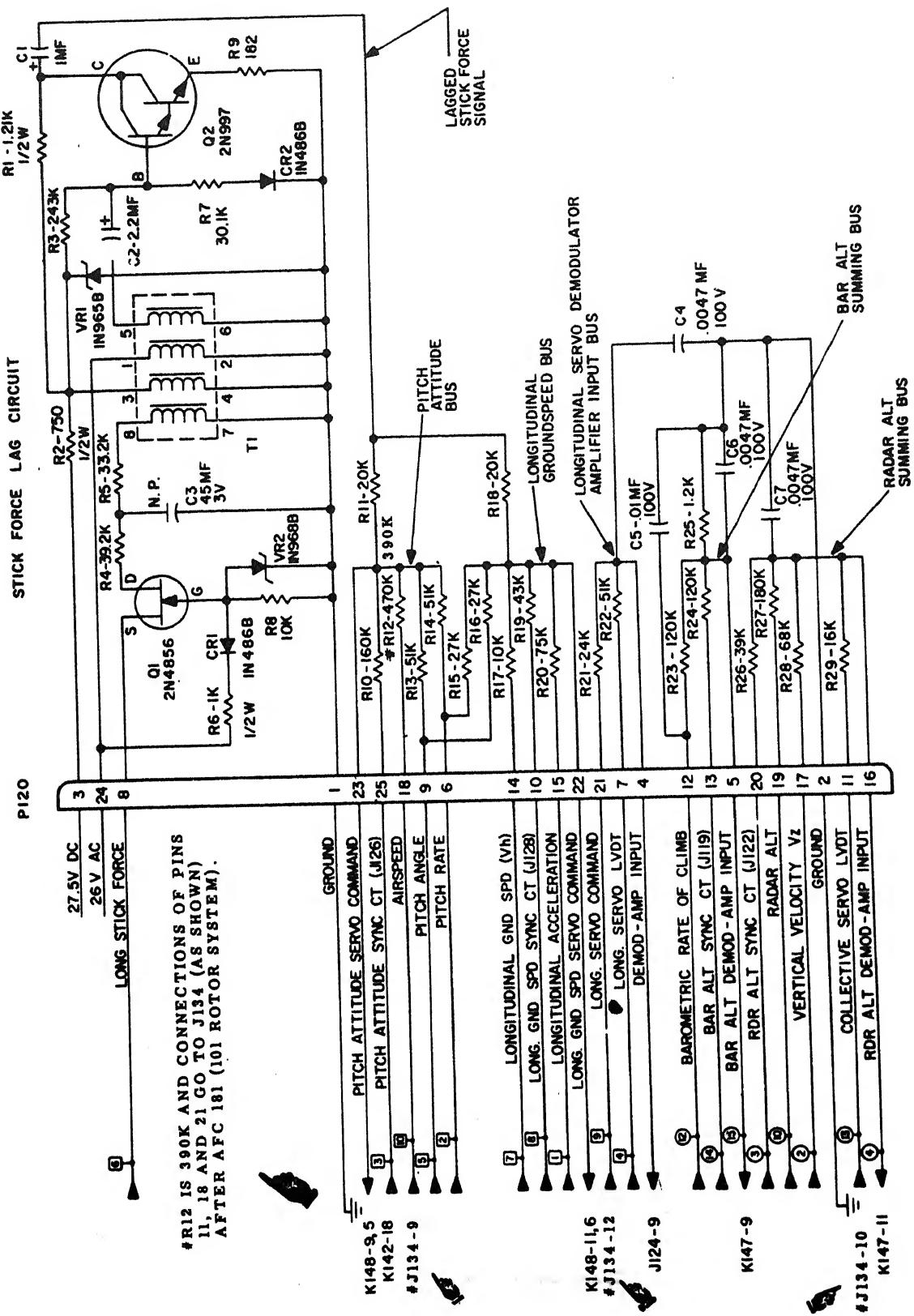
Airspeed SynchroTEL Transmitter



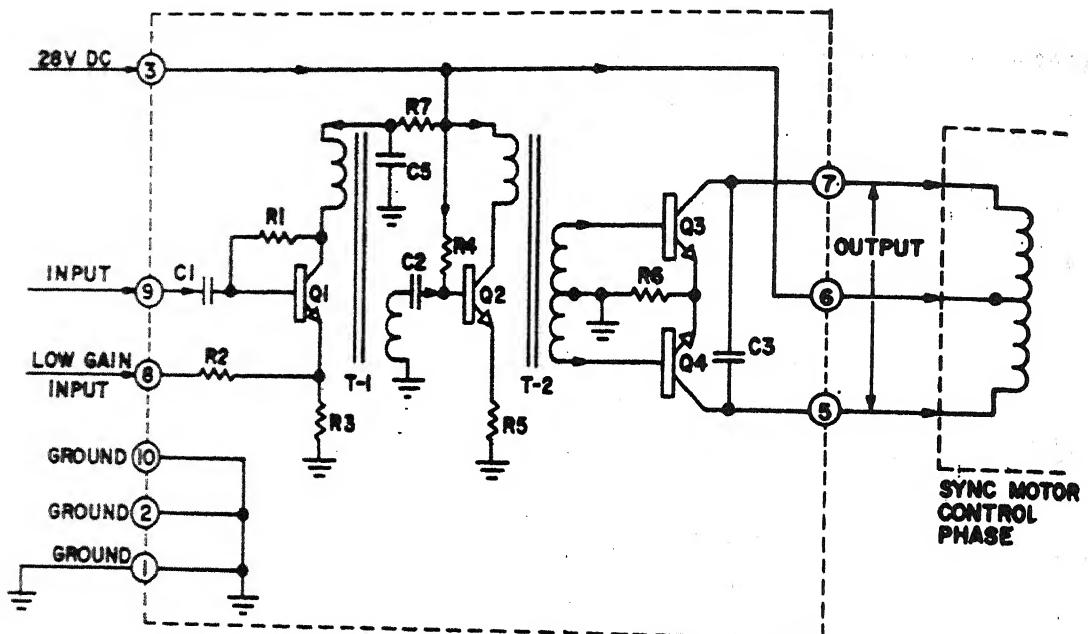
Stick Force Non-Linearity Circuit



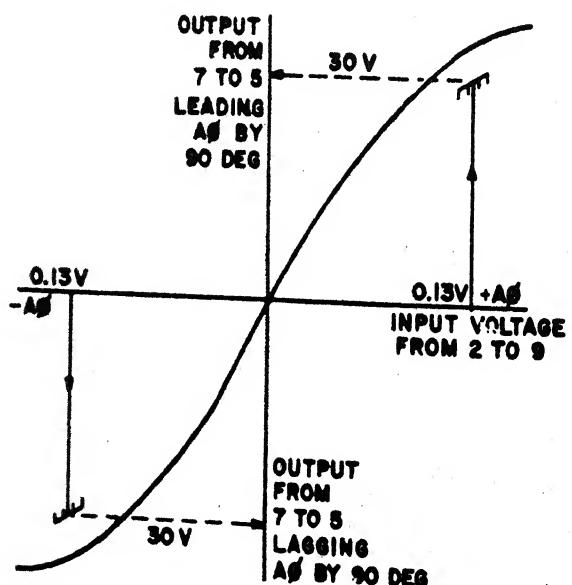
Summing Network (Lateral - Directional) J140



Summing Network (Longitudinal - Collective) J120

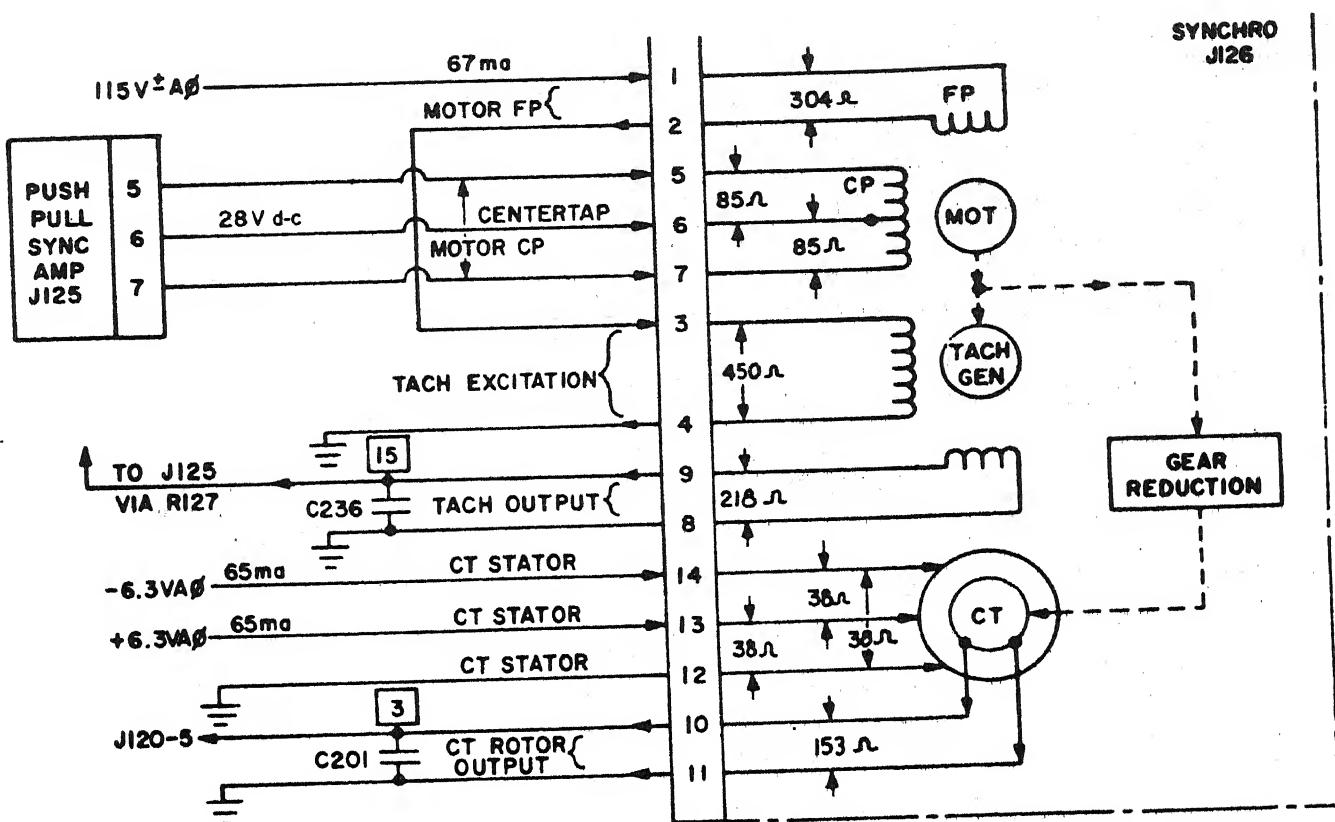


VIEW A

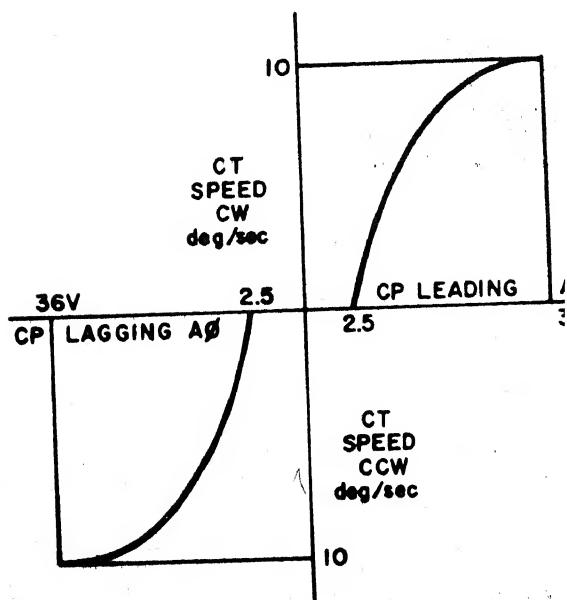


VIEW B

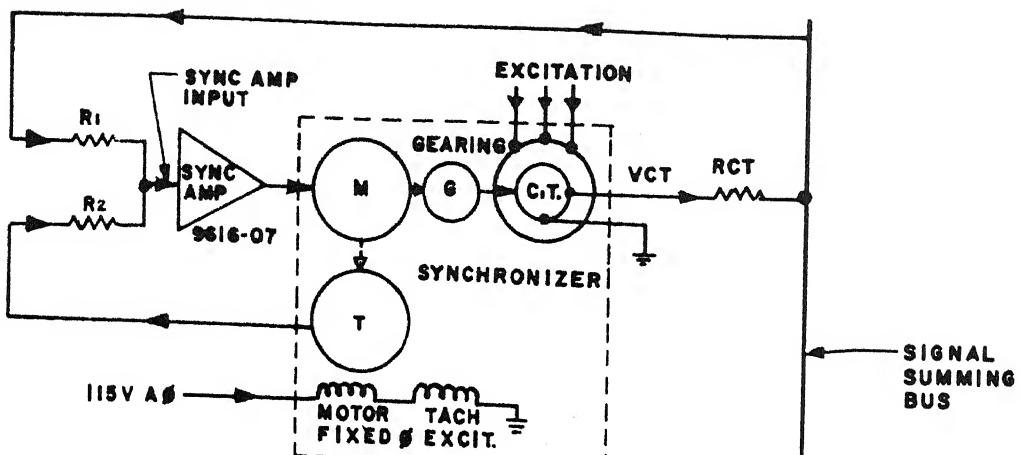
Synchronizer Amplifier



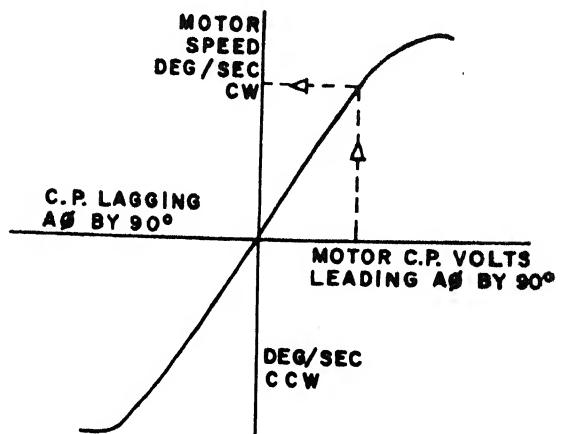
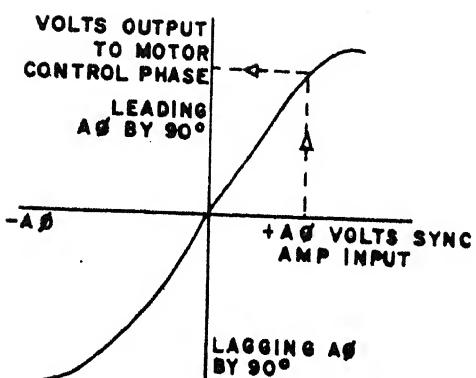
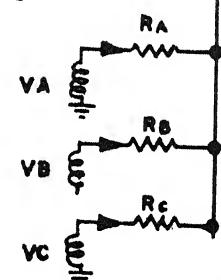
VIEW A (PITCH ATTITUDE SYNCHRONIZER (J126) SHOWN)



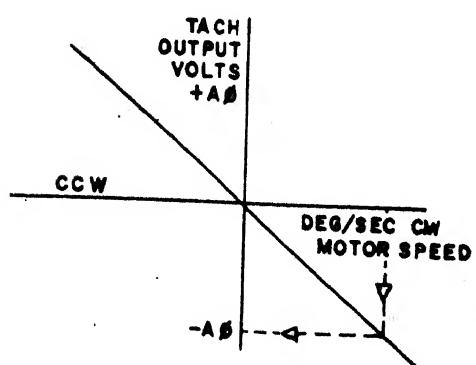
VIEW B



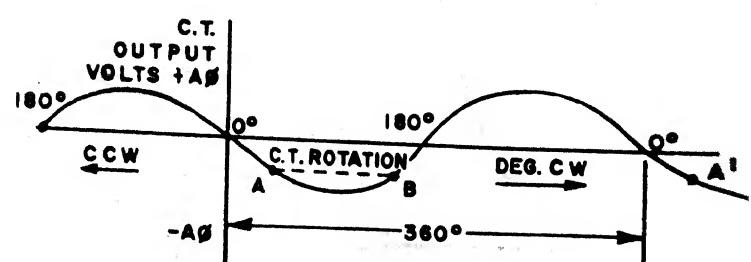
VIEW A



VIEW B

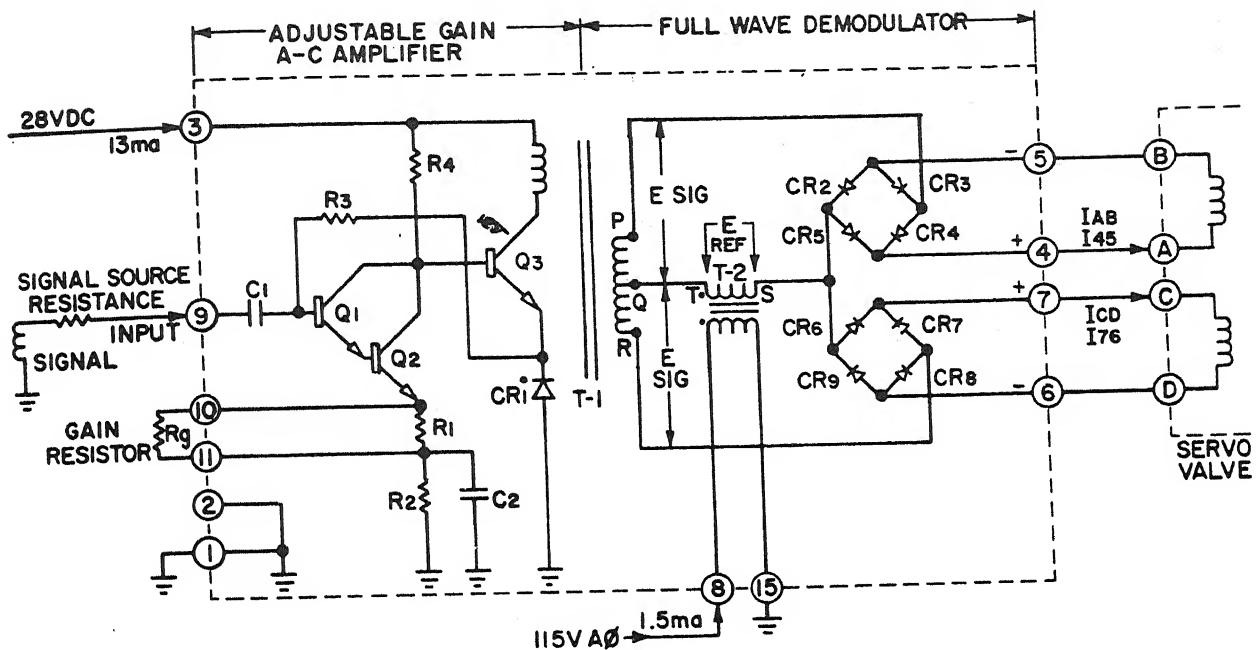


VIEW D

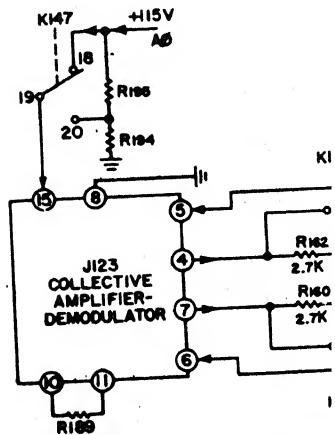
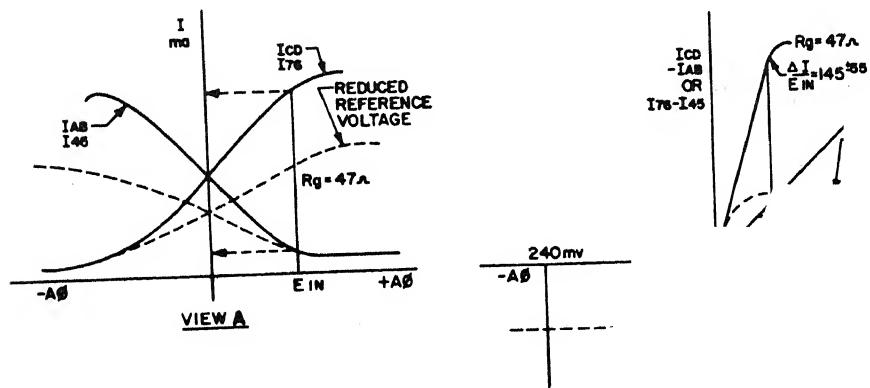


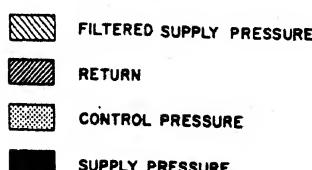
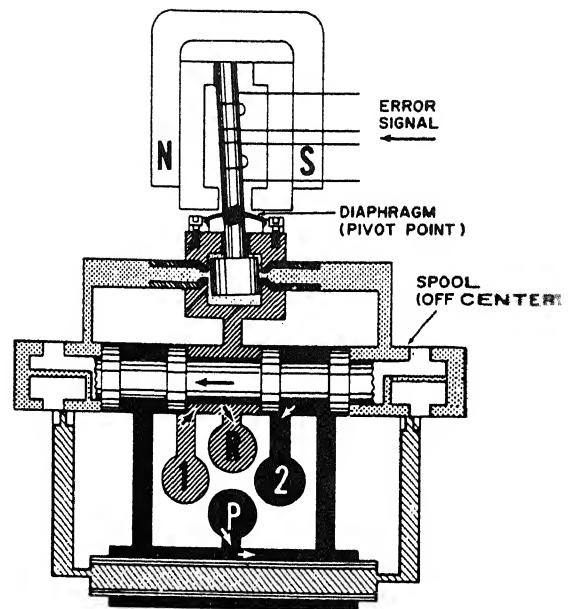
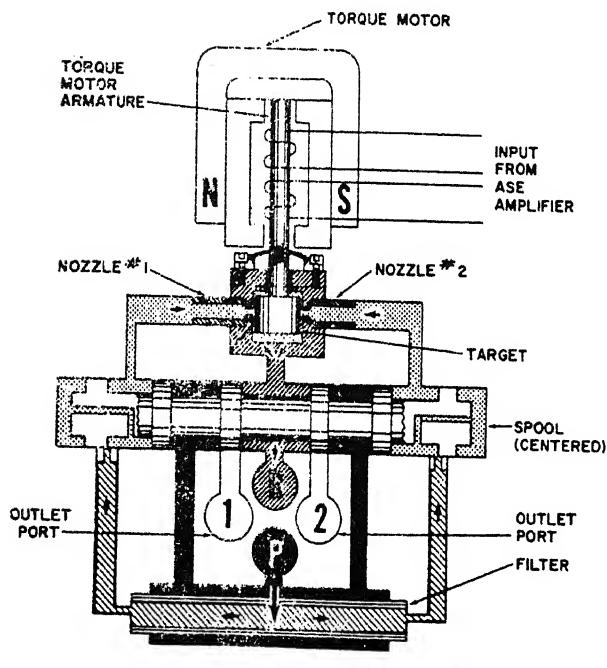
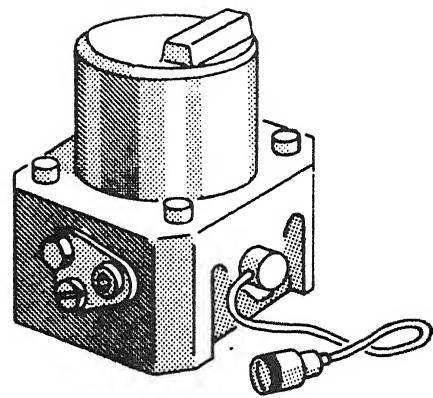
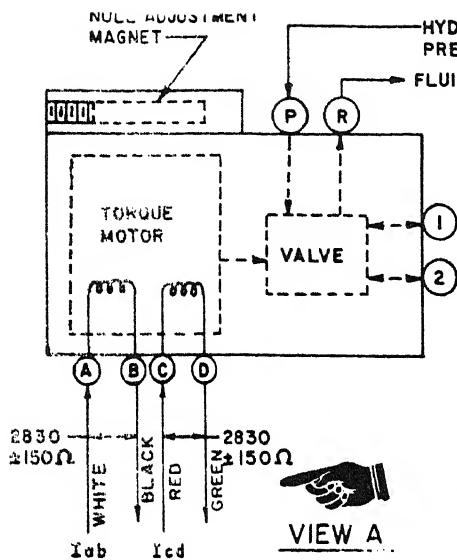
VIEW E

Principles of Synchronization



VIEW A
Demodulator Amplifier Schematic





Electro-Hydraulic Servo Valve – Schematic

SERIES CHANNELS

PITCH, ROLL, YAW

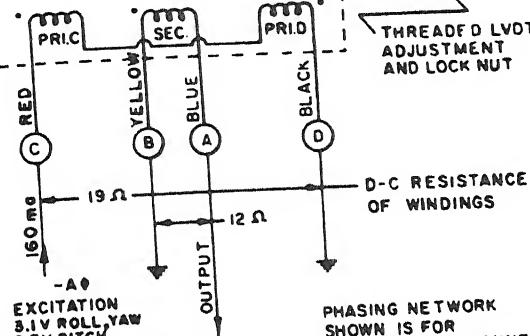
PITCH CHANNEL

-6.3 V A₀

LVDT CORE



THREADED LVDT
ADJUSTMENT AND LOCK NUT



VIEW A

CHANNEL TYPE

LVDT CORE

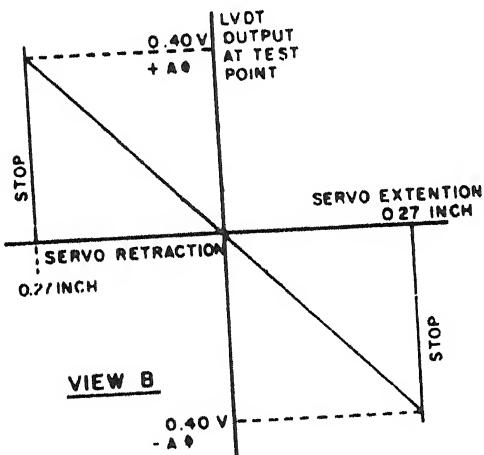
COLLECTIVE
SERVO
PISTON
MOTION

D-C RESISTANCE
OF WINDINGS

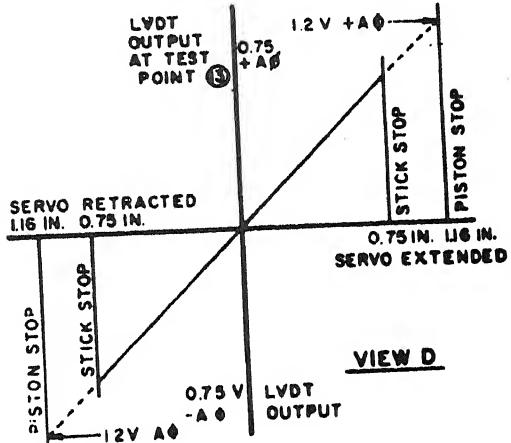
EXCITATION

TO PIN 11 ON J120

VIEW C



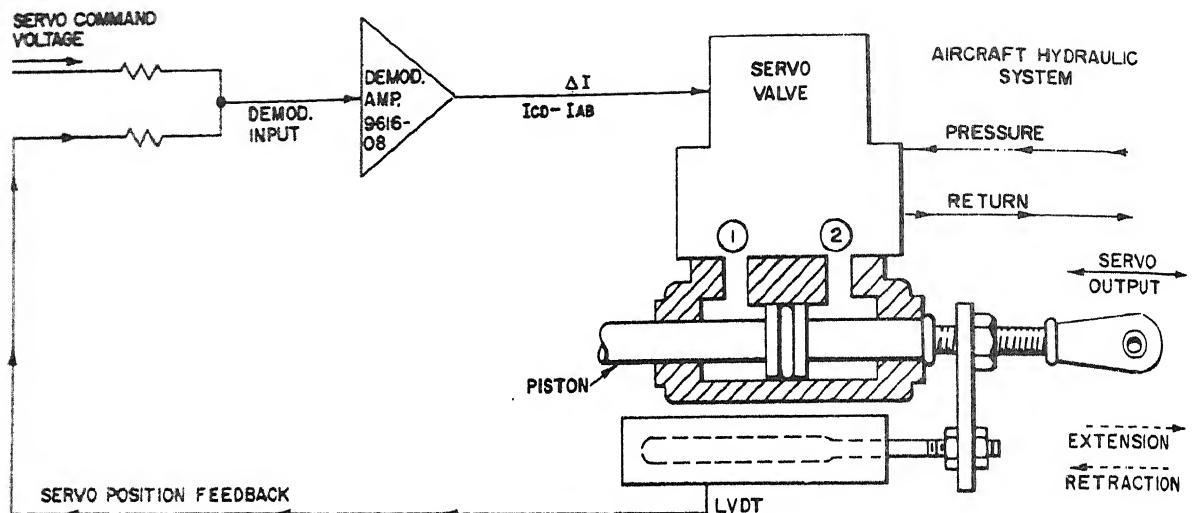
VIEW B



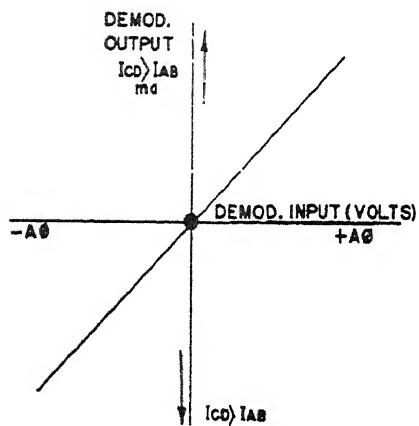
VIEW D

MAX STROKE FOR 5% LINEARITY
INSTALLED MAX STROKE
SENSITIVITY WITH PHASING NETWORK
400 cps EXCITATION @ 6.3 V. 400 cps
EXCITATION
QUADRATURE AND HARMONICS AT NULL
@ 31 V, 400 cps EXCITATION
PRIMARY D-C RESISTANCE
SECONDARY D-C RESISTANCE
EXCITATION CURRENT
(@ 3 IV, 400 cps EXCITATION)

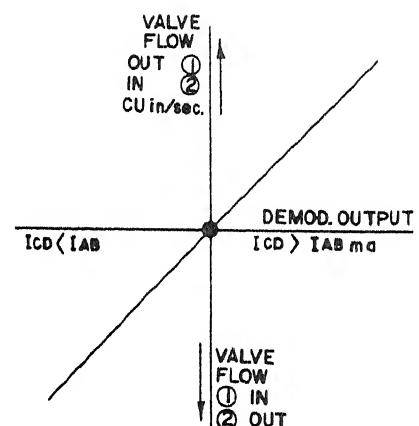
LVDT Line



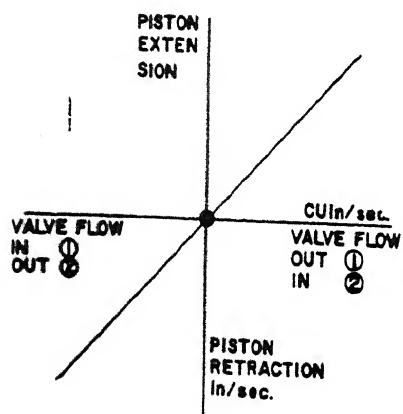
VIEW A



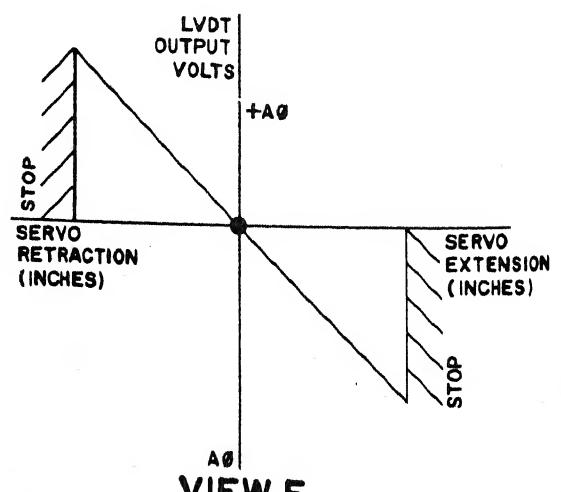
VIEW B



VIEW C

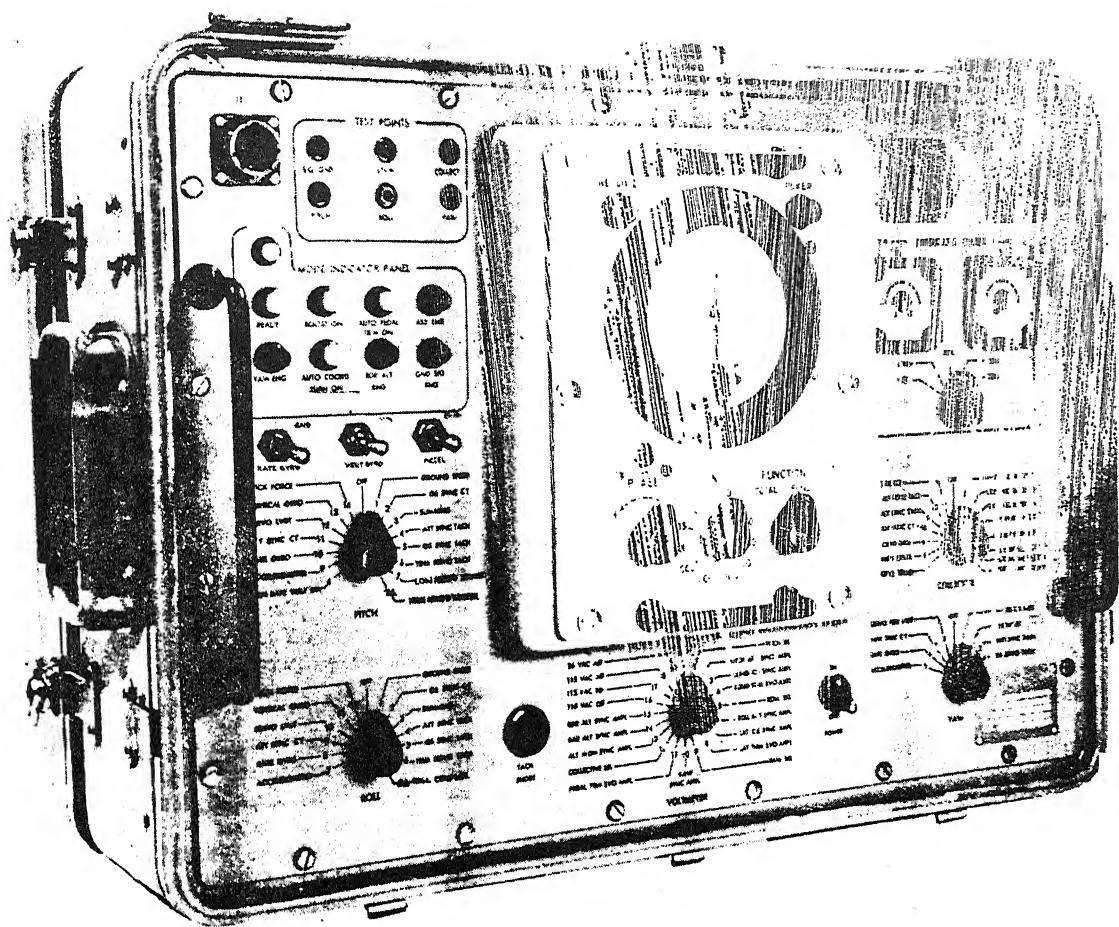


VIEW D

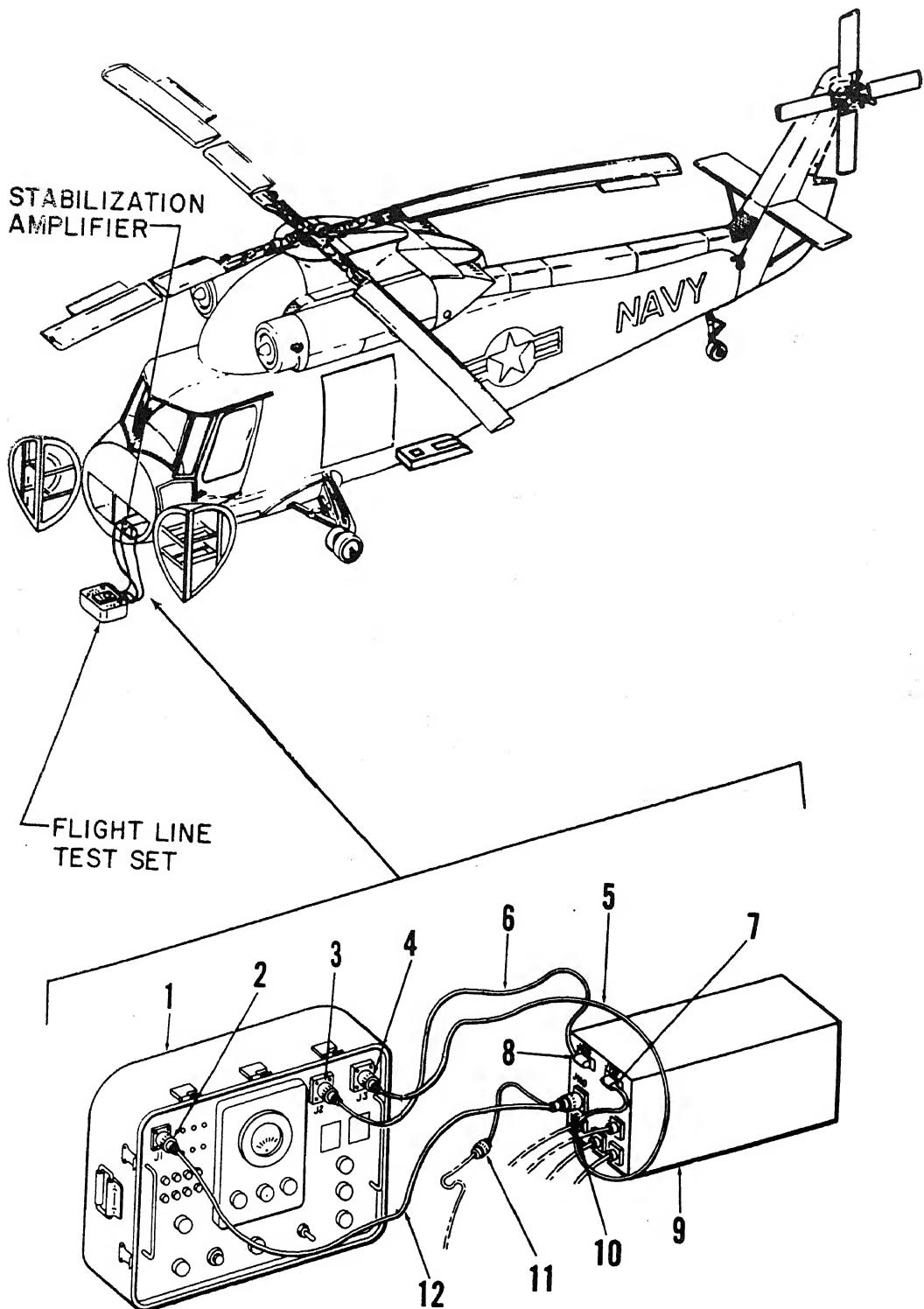


VIEW E

Principles of Operation - ASE Electro-Hydraulic Servo Valve

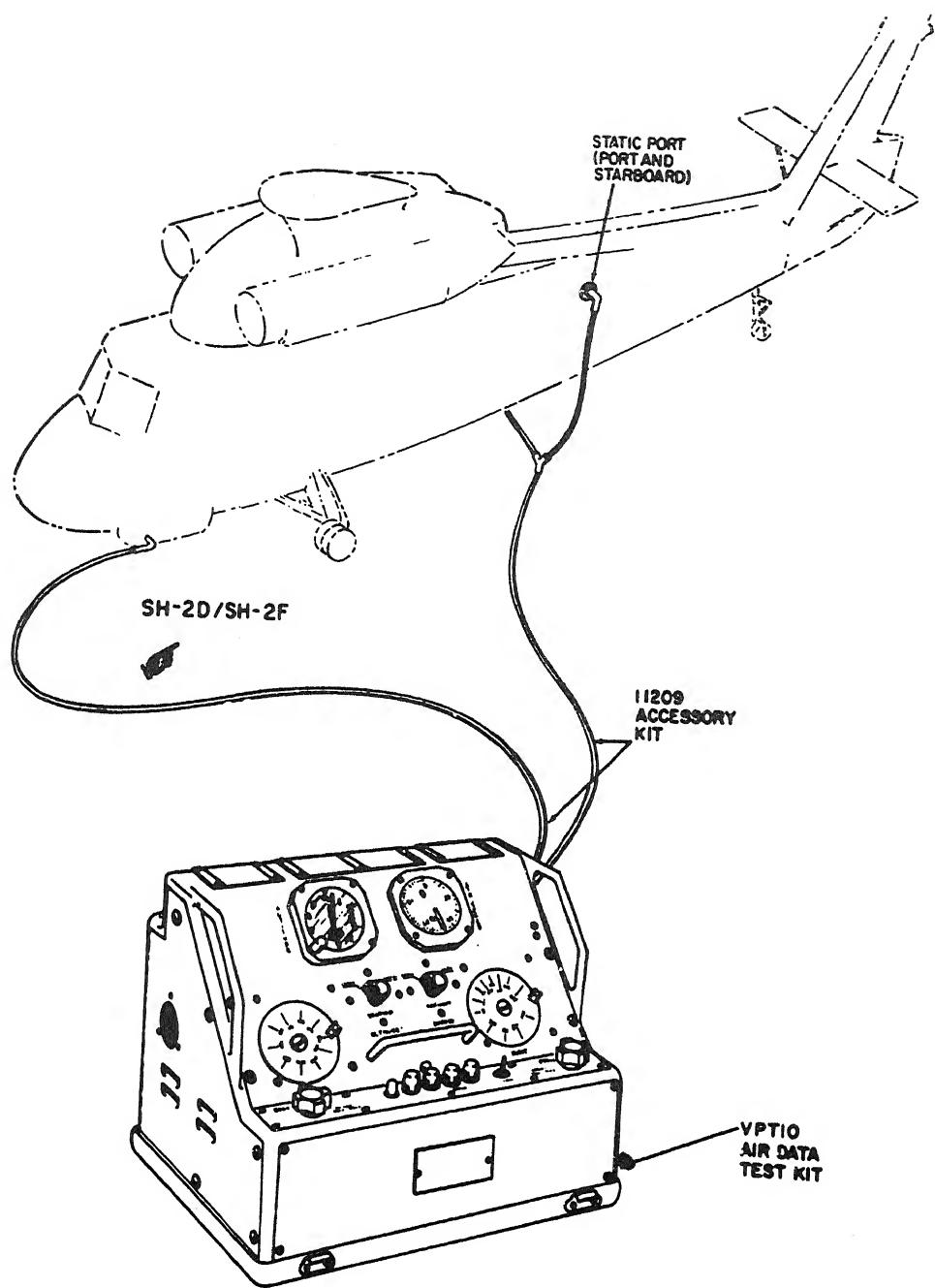


Flight Line Test Set



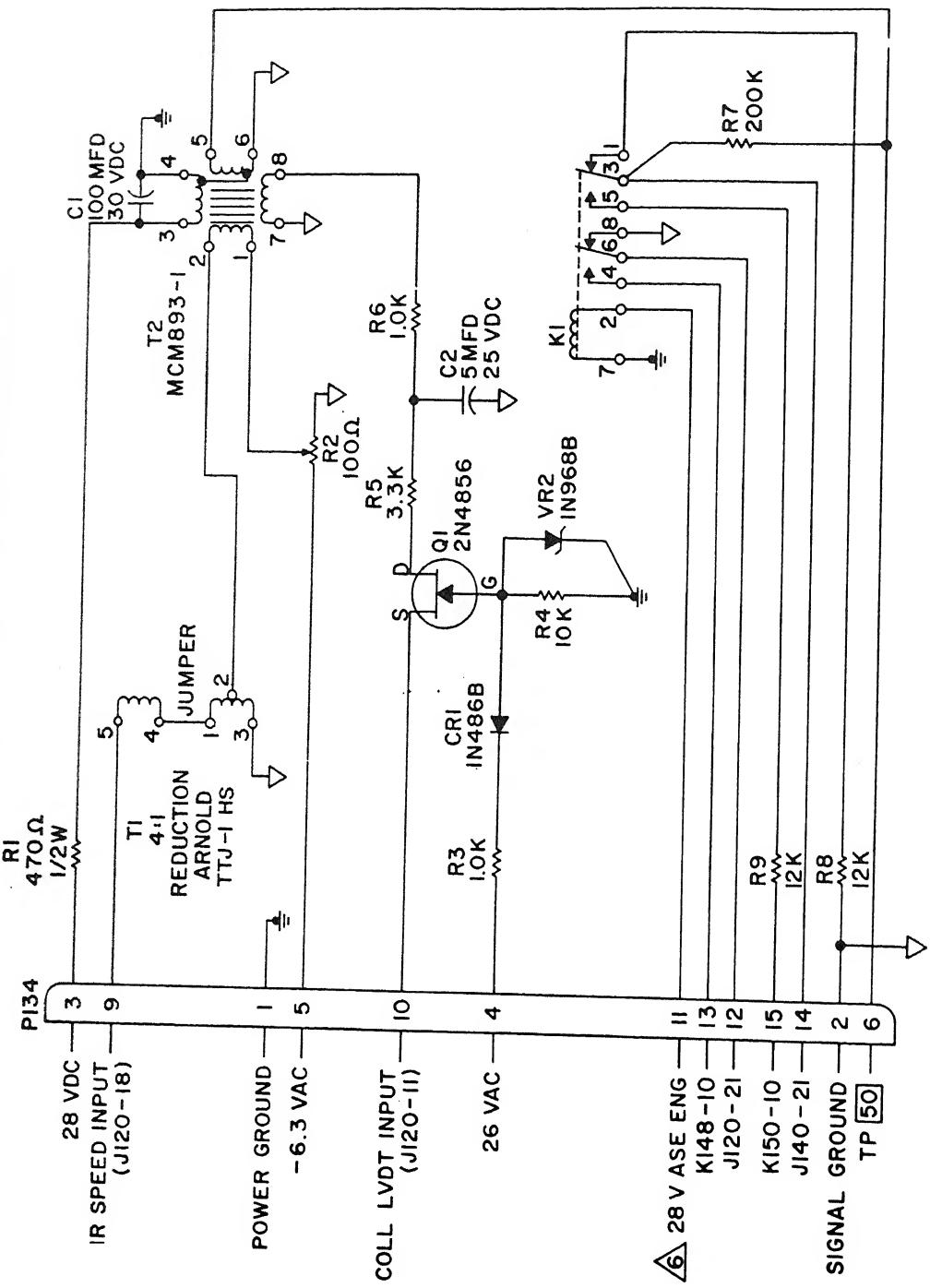
1. Flight line test set
2. Connector, P1
3. Connector, P2
4. Connector, P3
5. Cable assembly, P/N K604605-103
6. Cable assembly, P/N K604605-101
7. Connector, P157
8. Connector, P156
9. Stabilization amplifier
10. Connector, P110B
11. Connector, P110A
12. Cable assembly, P/N K604605-105

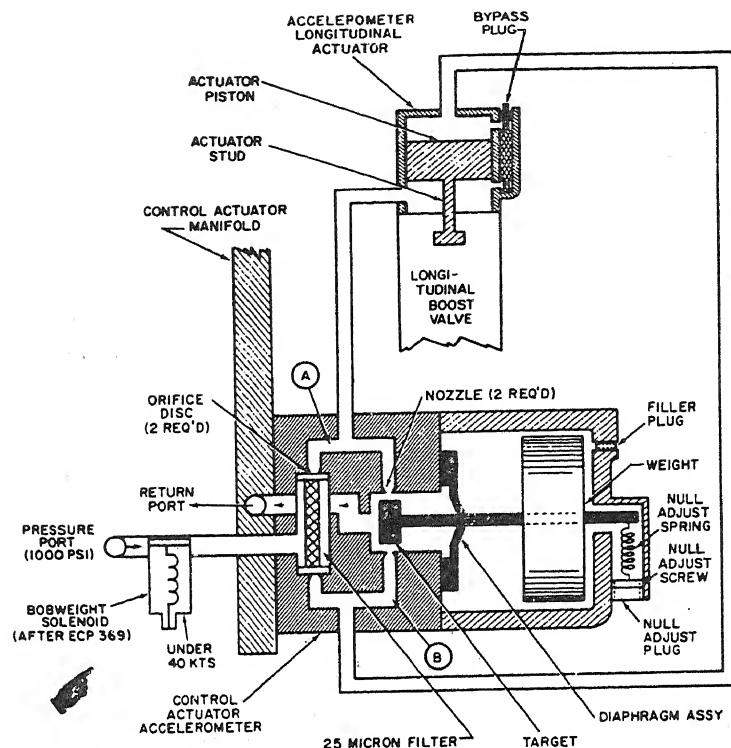
Flight Line Test Set Connected to Amplifier



Air Data Test Set

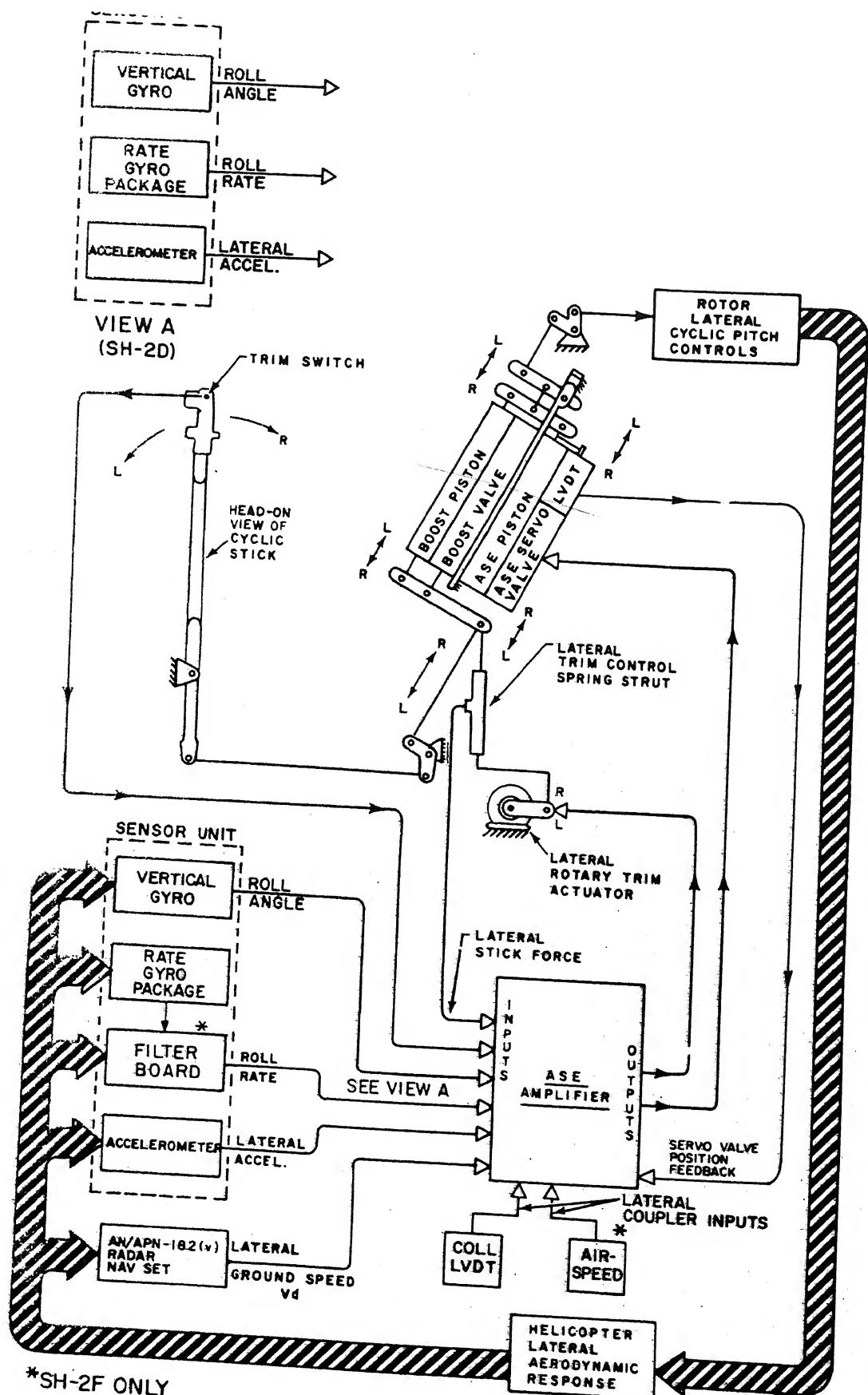
INSTALLED IN AMPLIFIER AFTER AFC ISI (IOI ROTOR)





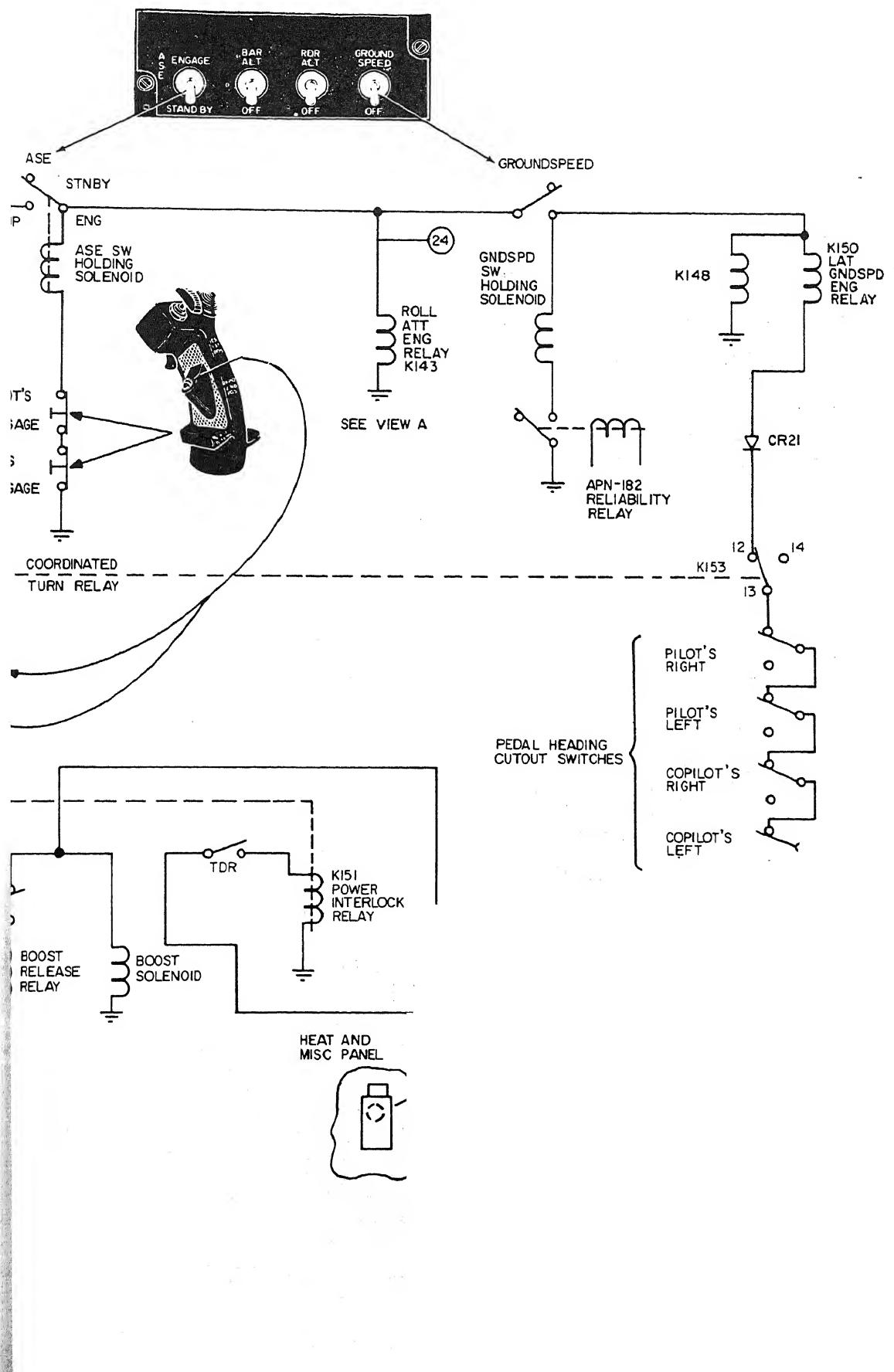
AFTER AFC 181

Control Actuator Accelerometer and Bobweight - Flow Diagram



Lateral Control Schematic and Roll Axis Block Diagram

ROLL CHANNEL CONTROL SWITCHING DIAGRAM



I TITLE: OPERATIONAL "QUICK-CHECK" OF THE ROLL CHANNEL OF ASE

II TOOLS, EQUIPMENT AND MATERIAL:

1. HH-2D Trainer, Section 1, Part No. K603903-5
2. Power Cart, Part No. K603923-1
3. ASE flight line test set, Part No. K604605-6
4. ASE Manual Maintenance Instructions, NA 01-260HCA-2-5
5. AE toolbox

FOR TRAINING PURPOSES ONLY

NOTE: To be used in conjunction with latest MMI test procedures.

III PROCEDURE:

1. ASE in "Standby and Warmup" mode
 - a. Run trim left and right. Stick should follow.
 - b. Monitoring TP 39 of J157 on .3 volt range, watch for bus voltage increase and decrease to zero while tilting sensor unit to the right 10° and holding. (Checks roll attitude sync loop)
 - c. Relevel sensor unit. (Check that lateral coupler relay prevents M1 and M2 movement while moving sensor)
2. ASE engaged mode (ASE engage light ON, meters nulled)
 - a. Tilt sensor unit to the left approximately 10° and hold: M1 increase and M2 decrease, and hold this way. (Lateral coupler K1 now engaged)

NOTE: This checks roll attitude mode with ASE engaged
 - b. Leave the demodulator meters split
3. Groundspeed engaged mode
 - a. Engage G/S switch and the meters should null out (Checks groundspeed sync loop)
 - b. Tilt sensor unit to right and M2 should increase as M1 decreases, and hold this way.
 - c. With the meters split, disengage groundspeed; meters should null out. (Checks roll attitude sync loop with G/S engaged)
 - d. Disengage ASE and continue

4. Checking servo valve, ASE piston movement and LVDT (requires hydraulics)
 - a. Apply hydraulic power
 - b. Watching demodulator meters, engage ASE; the meters should not split. If meters do split
 - (1) Check LVDT adjustment
 - (2) Ensure no output from J134 present
 - (3) Check servo valve adjustment
 - c. With nulled meters, tilting sensor unit should make ASE piston move and be immediately recentered by LVDT output.

- I TITLE: Operational Check of Roll Channel
- II Tools, Equipment and Material
 1. SH-2F flight control panel, section 1, K603903-5
 2. Power cart, K603023-3
 3. ASE flight line test set, K604605-6
 4. Manual Maintenance Instruction, NAVAIR 01-260HCO-2-5
- III PROCEDURE:
 1. Flight line test set hook-up
 - a. Insure that the ASE flight line test set is connected as required by paragraph 1-62, 1 through 2n
 2. System check
 - a. Refer to table 1-1, page 1-28, and complete test 1-7

CAUTION

Always insure that voltmeter range is at 300 during all switch changes, then reduce to proper range for voltage readings

NOTE

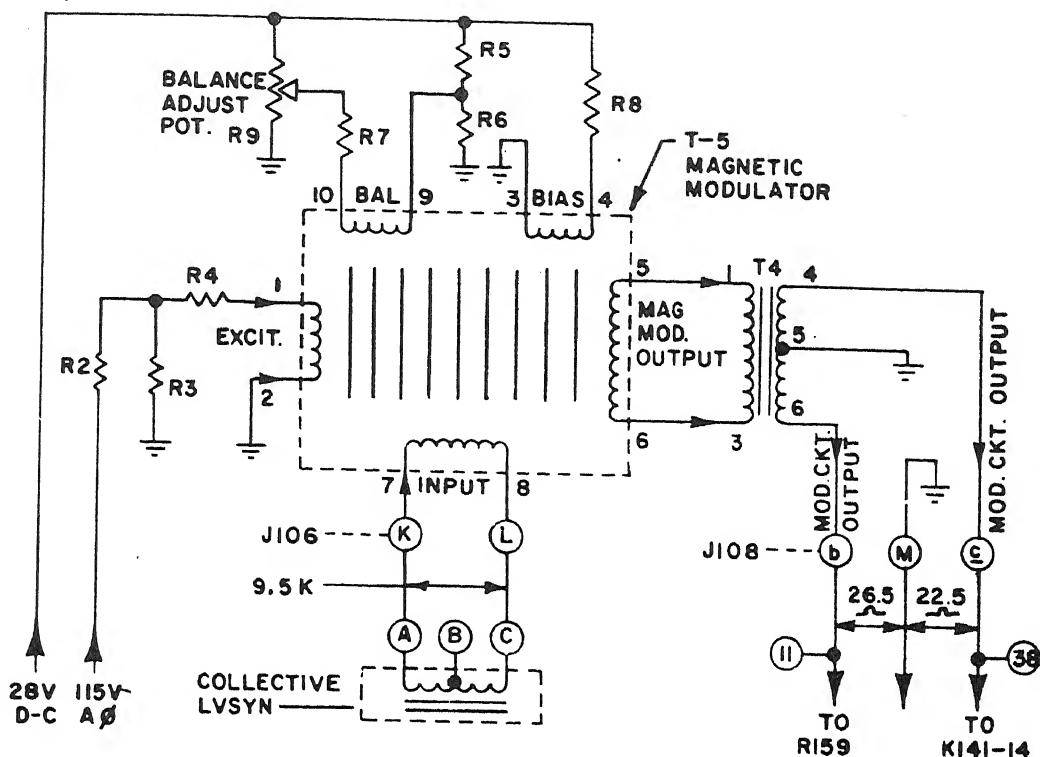
Allow approximately 30MV deviation due to system noise. Plus and minus readings may NOT have equal values due to noise. Variance in reading up to 50% are acceptable

- b. Refer to paragraph 1-67, page 1-33, and comply

NOTE

The column labeled "checking for" can be used to pinpoint location of signal under test on the ASE system schematic, figure 1-12, page 1-26.

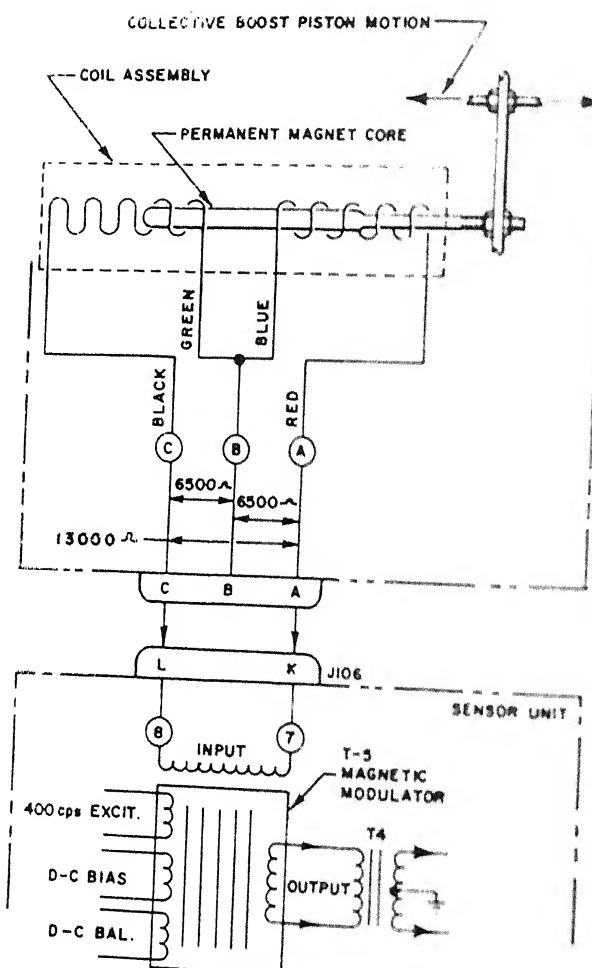
- c. Secure the test set and notify the instruction that you have completed the tests.



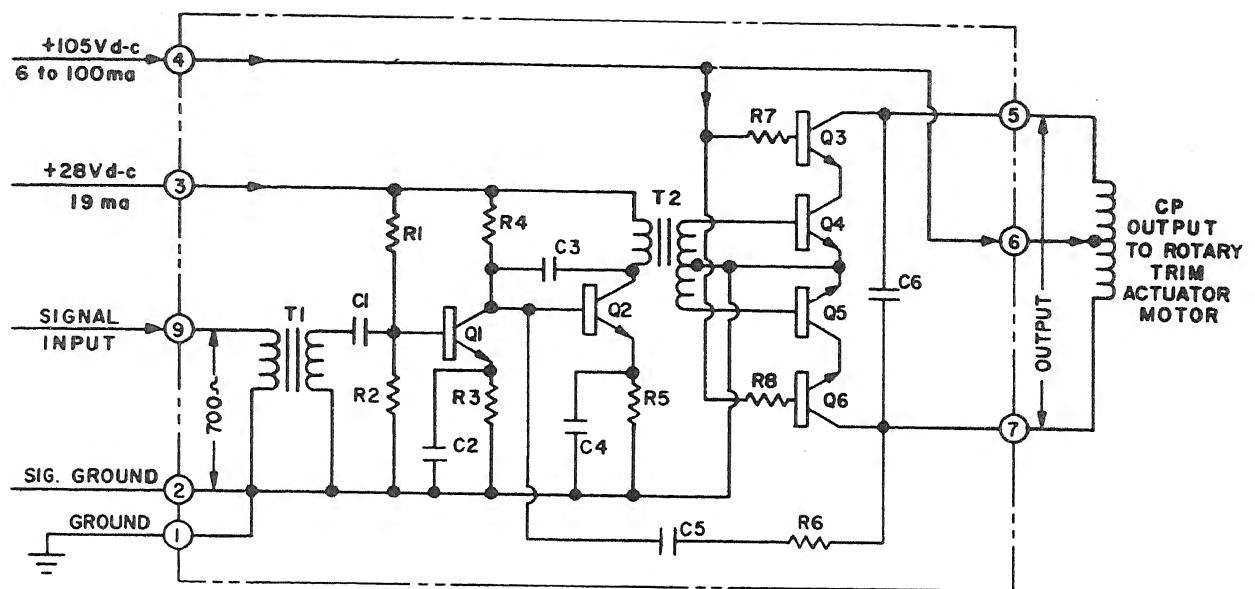
Magnetic Modulator Circuit

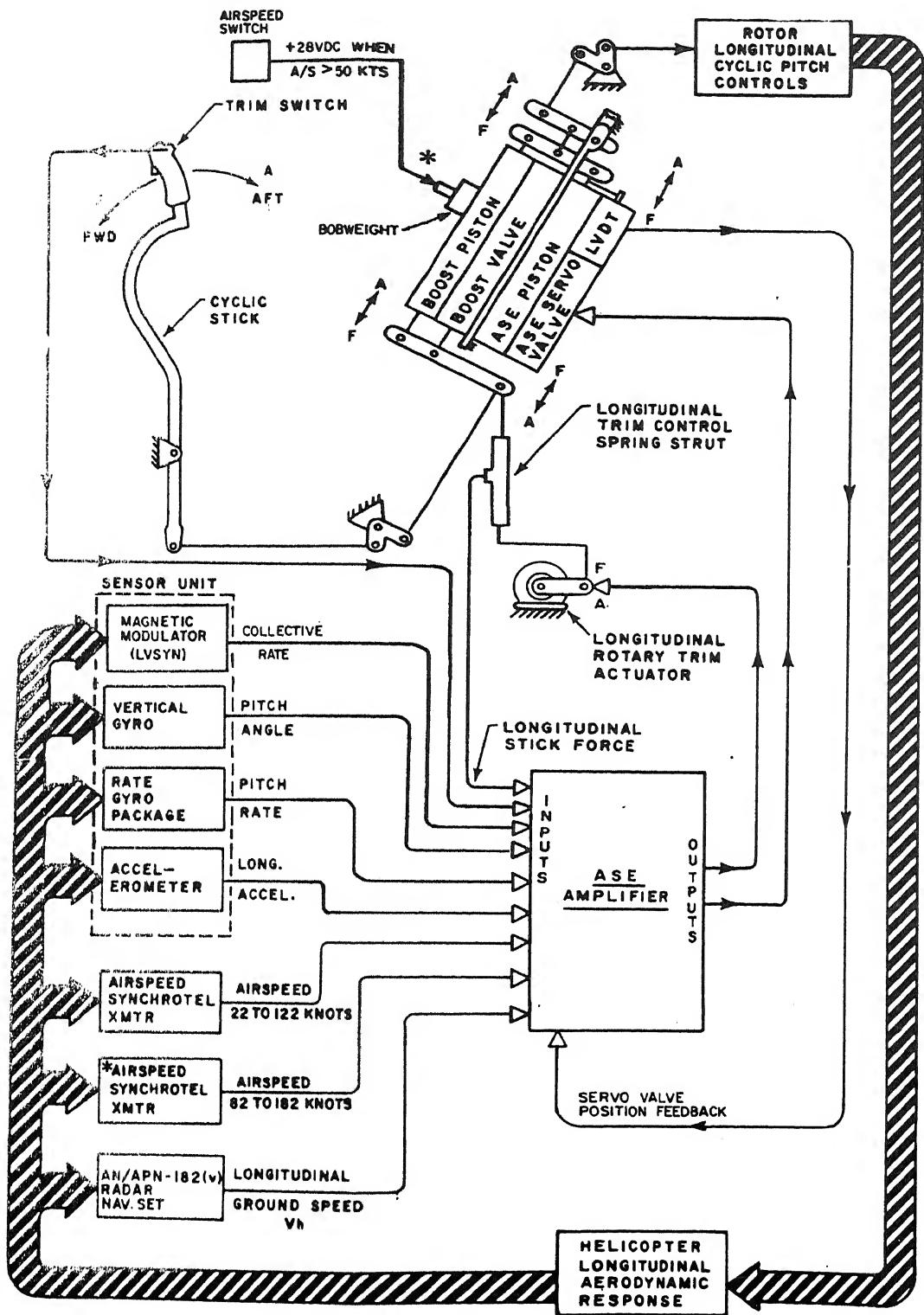
MODULATOR CIRCUIT CHARACTERISTICS

Sensitivity	0.027V rms (M to b to c) per microampere dc input
Null	0.020%
Output phasing	with ir to L: Out Out
	with in to L: Out Out
Maximum input	± 60 m



LVsyn Transducer — Schematic

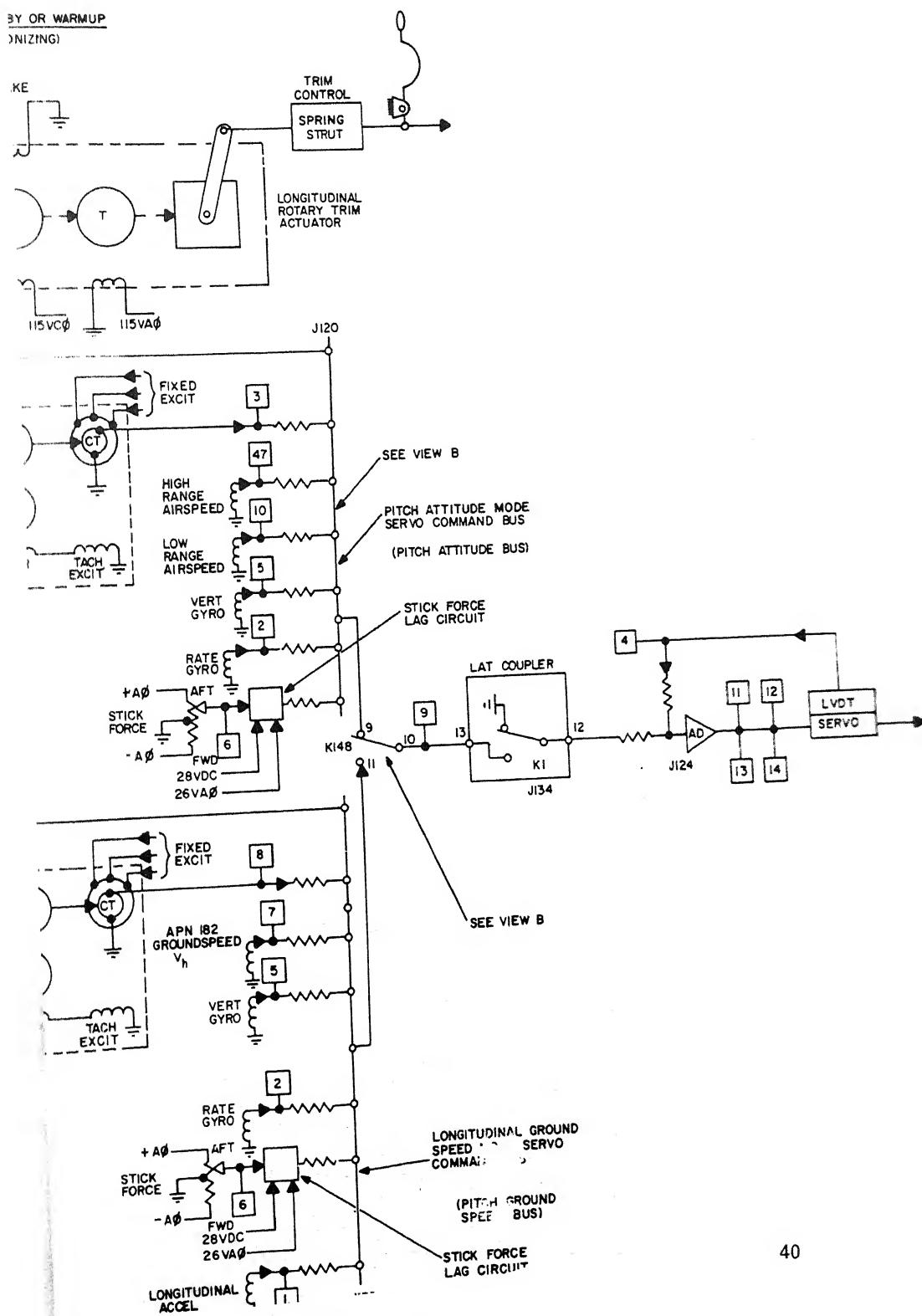




* INSTALLED ON ALL SH-2F HELICOPTERS

Longitudinal Control Schematic and Pitch Axis ASE Block Diagram

BY OR WARMUP
(INITIZING)



I TITLE: Operational Check of the Pitch Channel

II TOOLS, EQUIPMENT AND MATERIAL

1. SH-2F flight control panel, section 1, K603903-5
2. Power Cart, K603923-3
3. ASE flight line test set, K604605-6
4. Manual Maintenance Instruction, NAVAIR 01-260HC0 -2-5
5. Air data test set, VPT-10HS11633

III PROCEDURE

1. Flight line test set hook-up

- a. Insure that the ASE flight line test set is connected as required by paragraph 1-62, 1 through Zn

2. System Check

- a. Refer to table 1-1, page 1-28, and complete test 1-7

CAUTION

Always insure that voltmeter range is at 300 during all switch changes, then reduce to proper range for voltmeter readings

NOTE

Allow approximately 30MV deviation due to system noise. Plus and minus readings may NOT have equal values due to noise. Variance in reading up to 50% are acceptable

- b. Connect the VPT-10HS, using the accessory kit, in accordance with instructions.

CAUTION

Insure that lines are conn^{ed}
serious damage will occ^{ur}
ASE equipment and instruments

NOTE

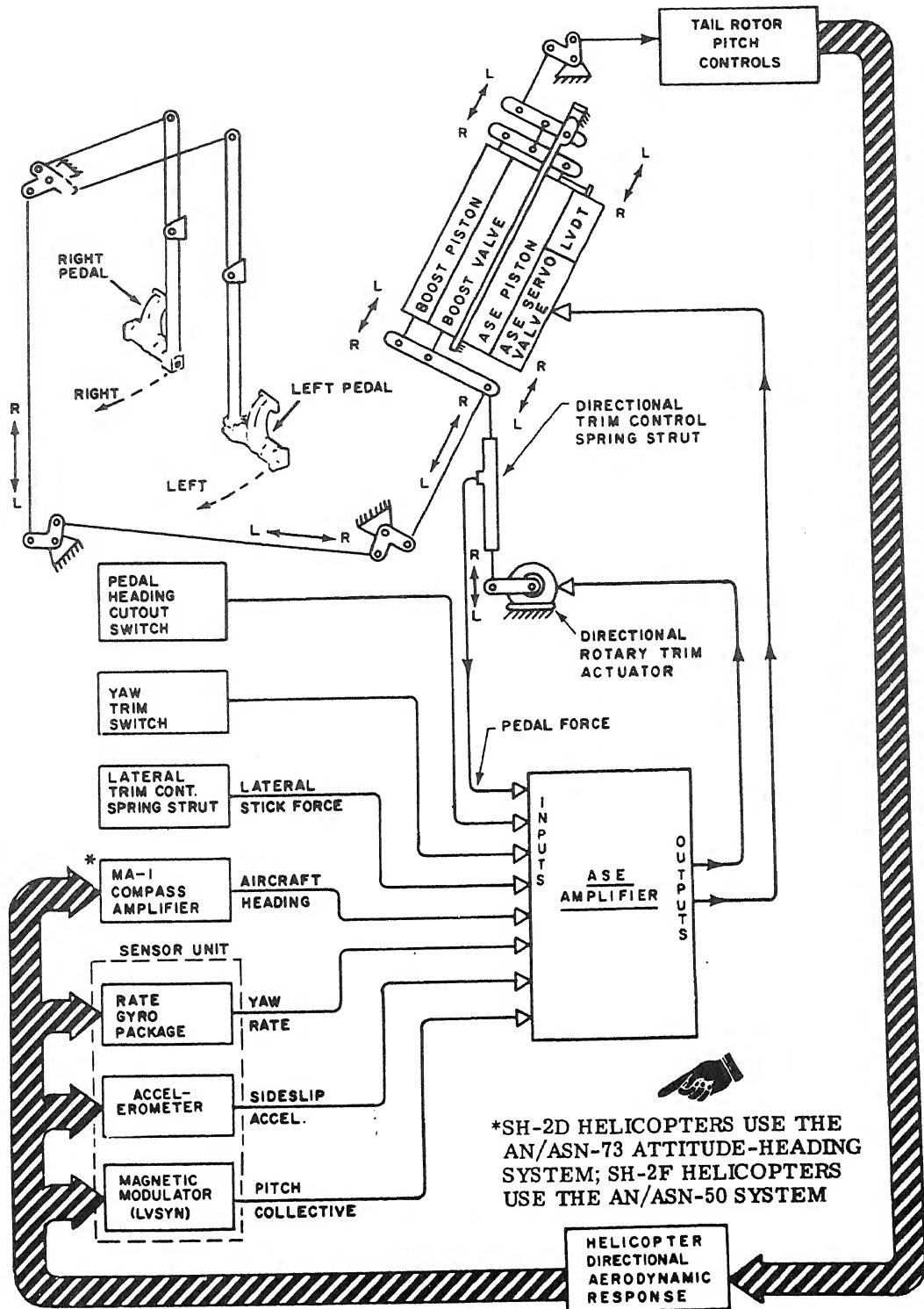
Do not operate VPT-10HS until called for during operational check

- c. Refer to paragraph 1-65, page 1-27, and comply

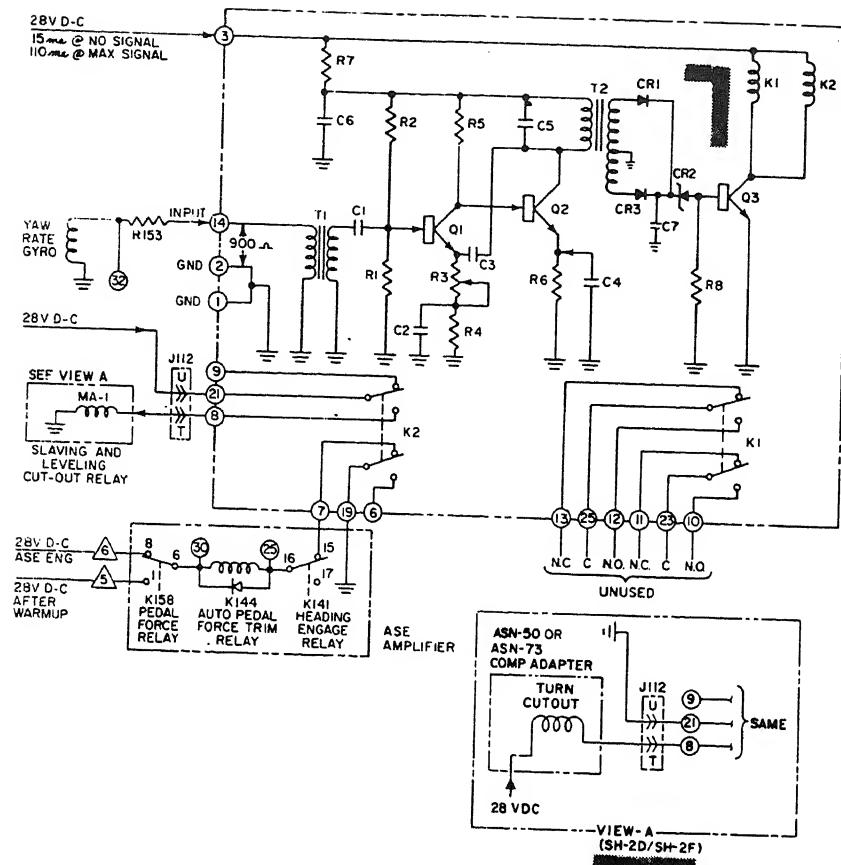
NOTE

The column labeled "checking for" can be used to pinpoint location of signal under test on the ASE system schematic. Figure 1-12, page 1-26.

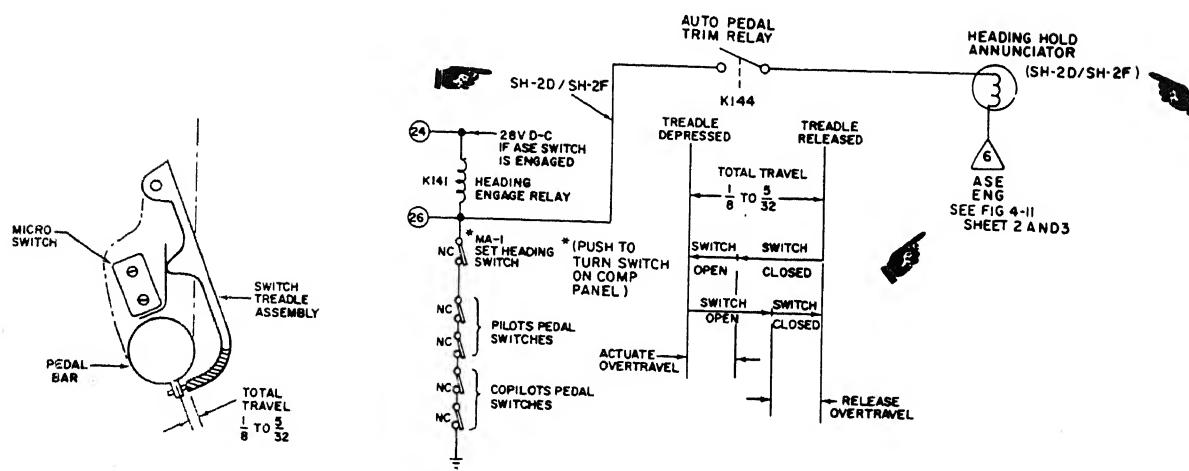
- d. Secure the test sets and notify the instructor that you have completed the test.



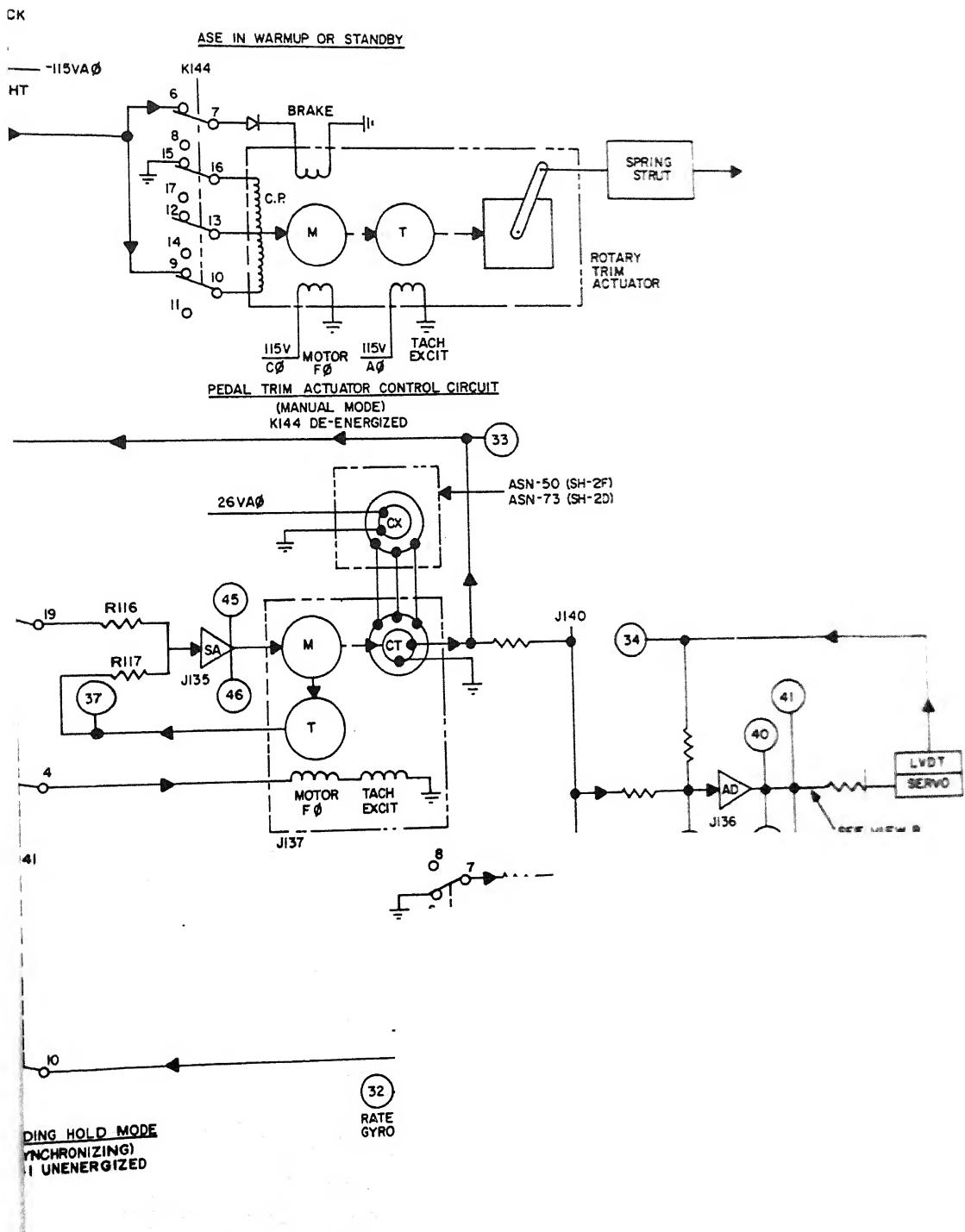
Directional Control Schematic and Yaw Axis ASE Block Diagram



Relay Driver Amplifier



and Copilot's Heading Disengage Switches



I TITLE: OPERATIONAL CHECK OF YAW CHANNEL

II TOOLS, EQUIPMENT AND MATERIALS

1. SH-2F flight control panel section 1, K603003-5
2. Power cart, K603923-3
3. ASE Flight line test set, K604605-6
4. Manual Maintenance Instruction, NAVAIR 01-260HCD-2-5

III PROCEDURE

1. Flight Line Test Set Hook-up

- a. Insure that the ASE flight line test set is connected as required by paragraph 1-62, 7 through 2N

2. System check

- a. Refer to table 1-1, page 1-28, and complete test 1-7

CAUTION

Always insure that voltmeter range is at 300 during all switch changes, then reduce to proper range for voltmeter readings

NOTE

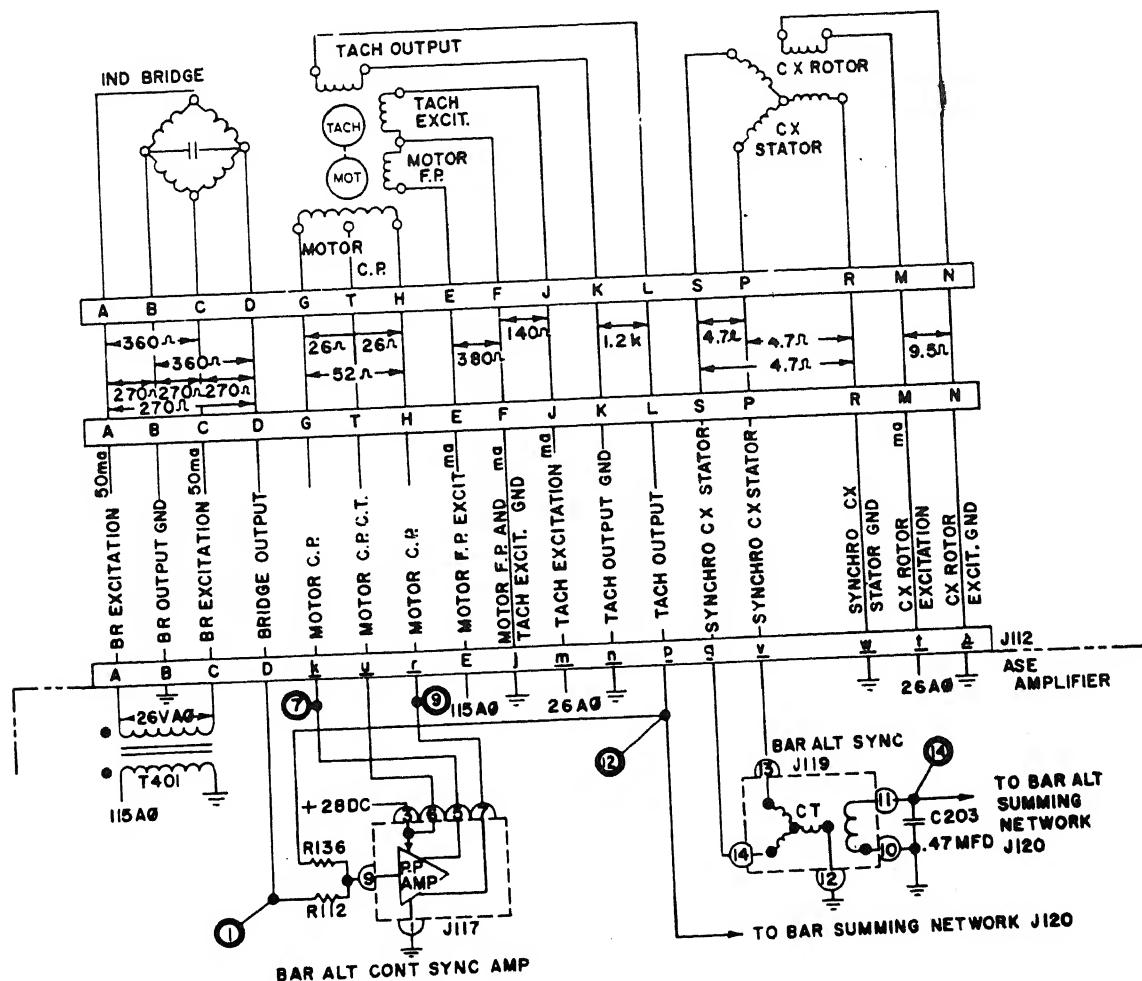
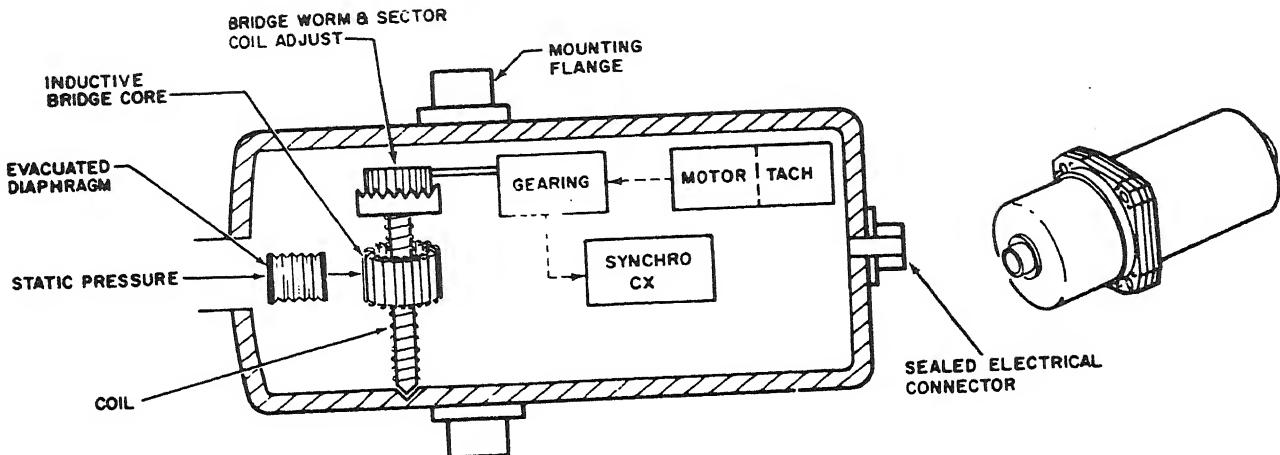
Allow approximately 30 MV deviation due to system noise. Plus and minus readings may NOT have equal values due to noise. Variance in reading up to 50% are acceptable.

- b. Refer to paragraph 1-69, page 1-37, and comply.

NOTE

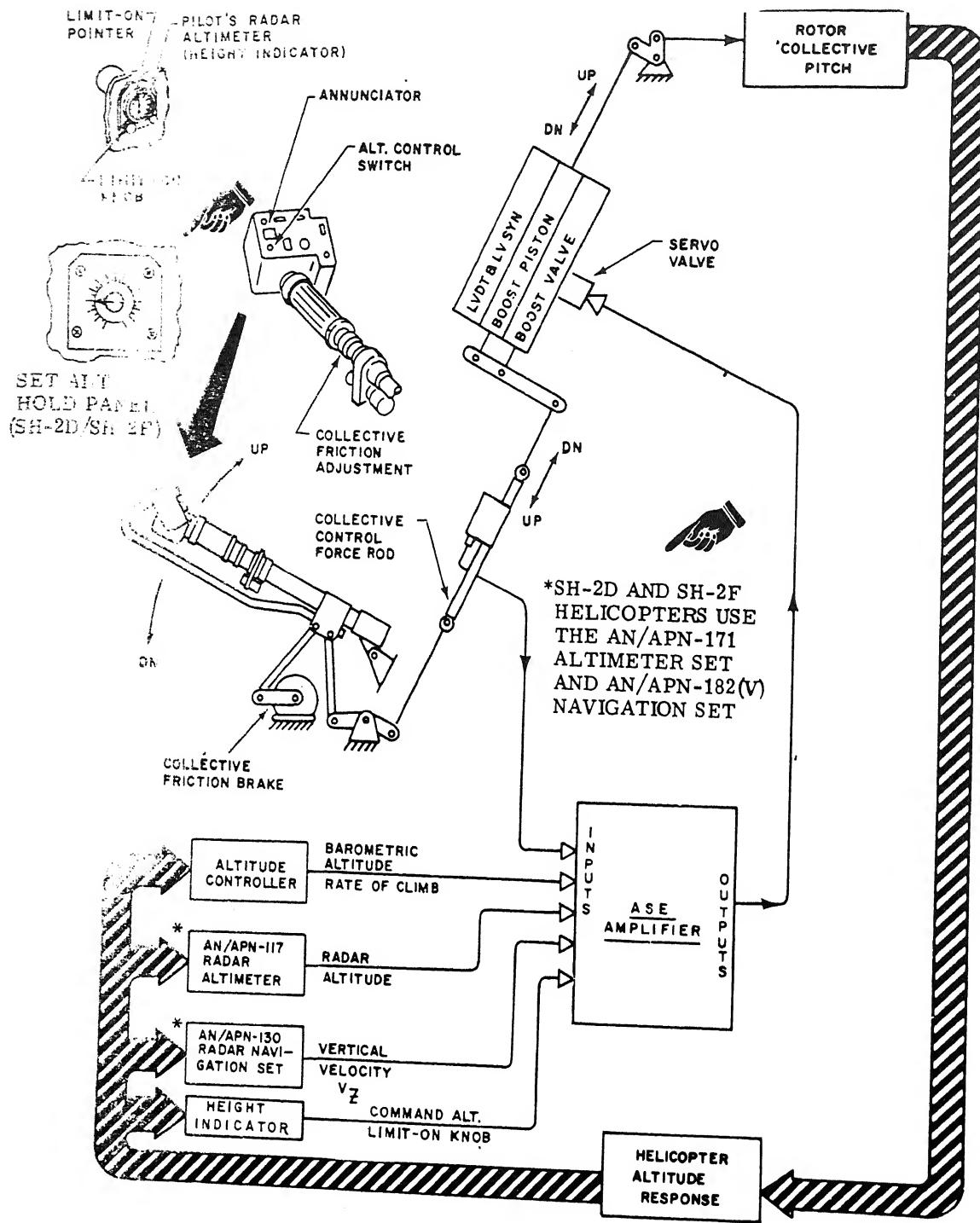
The column labeled "checking" is to pinpoint location of signal in the ASE system schematic, fig

- c. Secure the test set and notify the instructor that you have completed the tests.



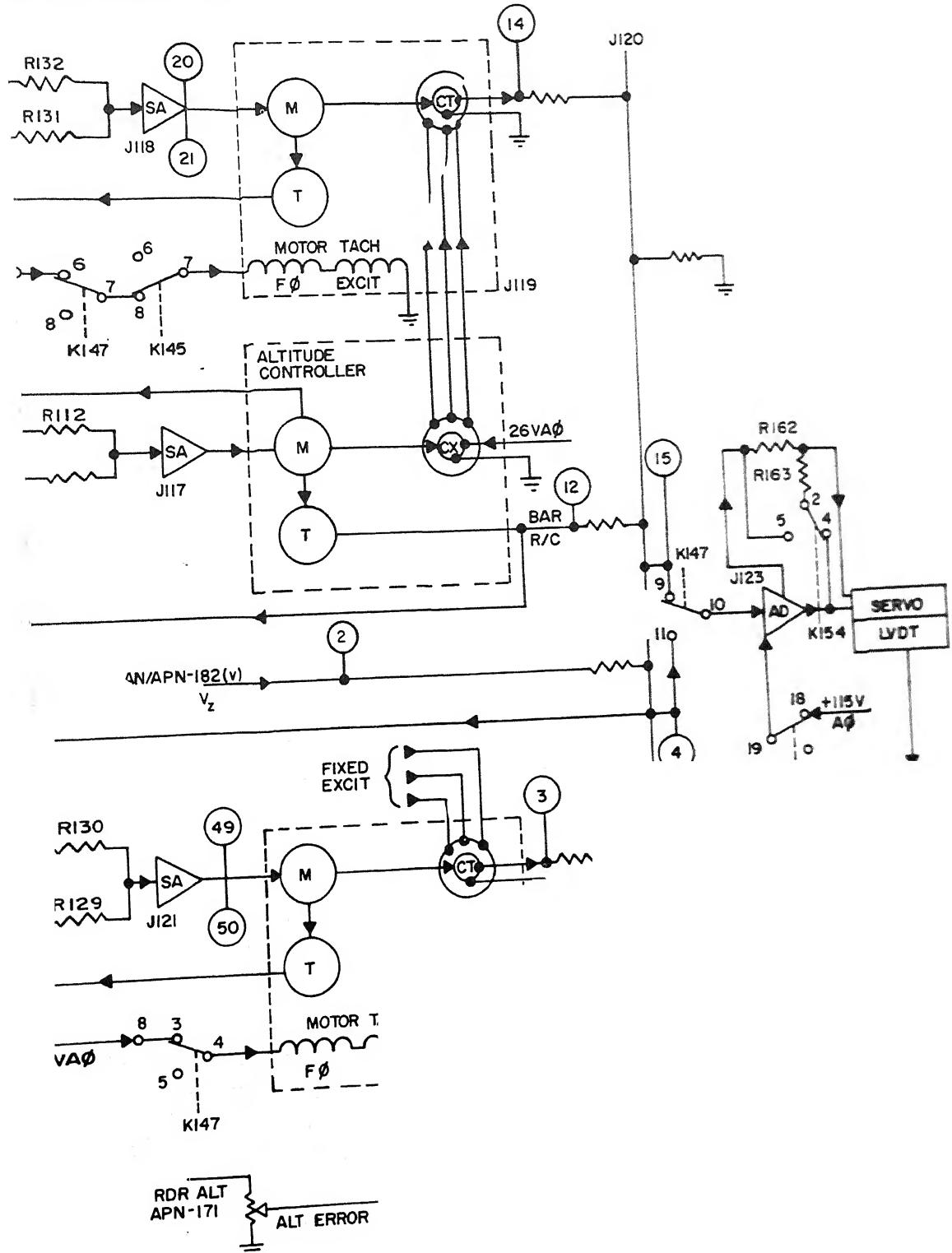
○ TEST POINTS ON
AMPLIFIER TEST
RECEPTACLE J156

Altitude Controller



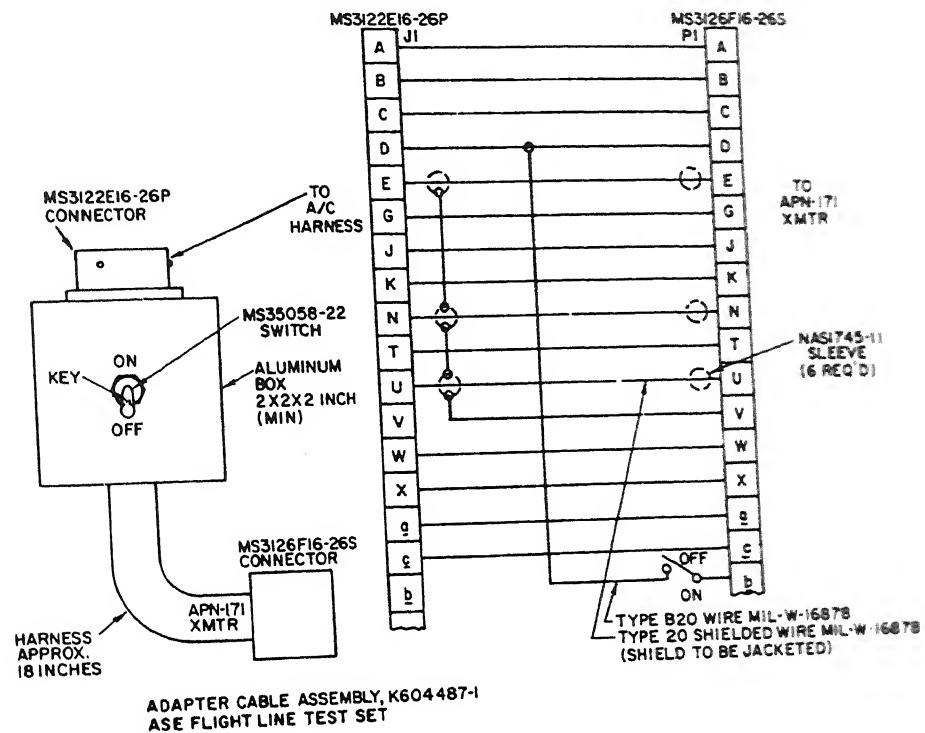
Collective Control Schematic and Altitude Control Block Diagram

ALTITUDE CONTROL MODE ENGAGED



ADAPTER CABLE ASSEMBLY, K604487-1
(ASE Flight Line Test Set). Adapter cable assembly,
K604487-1, required for flight line testing of

the ASE System in SH-2D/SH-2F helicopters
may be locally manufactured



I TITLE: Operational Check of Collective Channel

II TOOLS, EQUIPMENT AND MATERIALS

1. SH-2F Flight control panel, section 1, K603903-5
2. Power cart, K603923-3
3. ASE flight line test set, K603903-5
4. Manual Maintenance Instruction, NAVAIR 01-250HED-2-5
5. Air Data Test set, VPT-10HS11533

III Procedure

1. Flight line test set hook-up

- a. Insure that the ASE flight line test set is connected as required by paragraph 1-62, 1 through 2n

2. System check

- a. Refer to Table 1-1, page 1-28, and complete test 1-7

CAUTION

Always insure that voltmeter range is at 300 during all switch changes, then reduce to proper range for voltmeter readings

NOTE

Allow approximately 30MV deviation due to system noise. Plus and minus readings may NOT have equal values due to noise. Variance in reading up to 50% are acceptable

- b. Connect the VPT-10HS, using the accessory kit, in accordance with instructions.

CAUTION

Insure that lines are connected properly or serious damage will occur to the system trainer ASE equipment and instruments.

NOTE

Do NOT operate VPT-10HS until called for during operational check

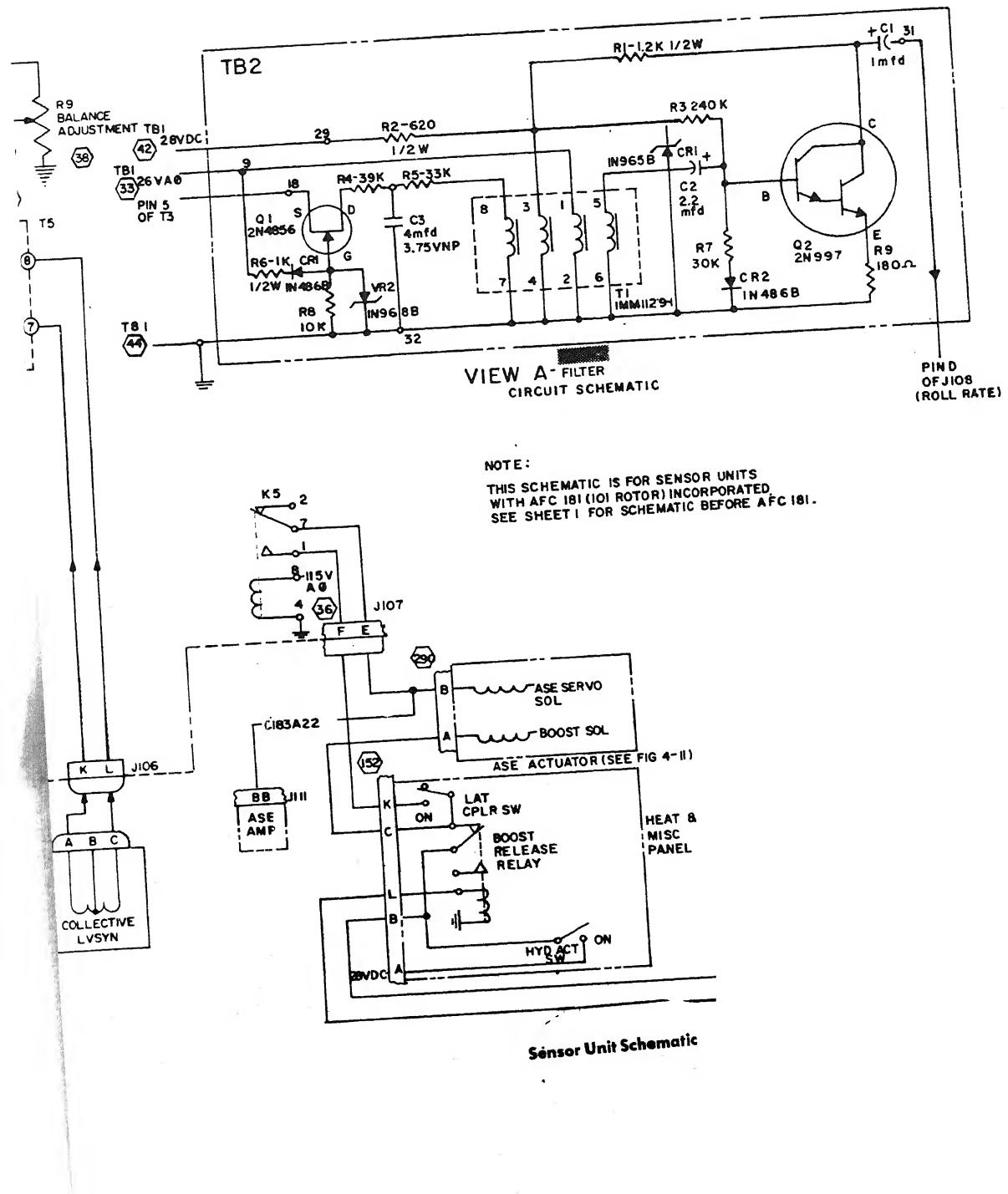
- c. Refer to paragraph 1-71, page 1-41, and comply

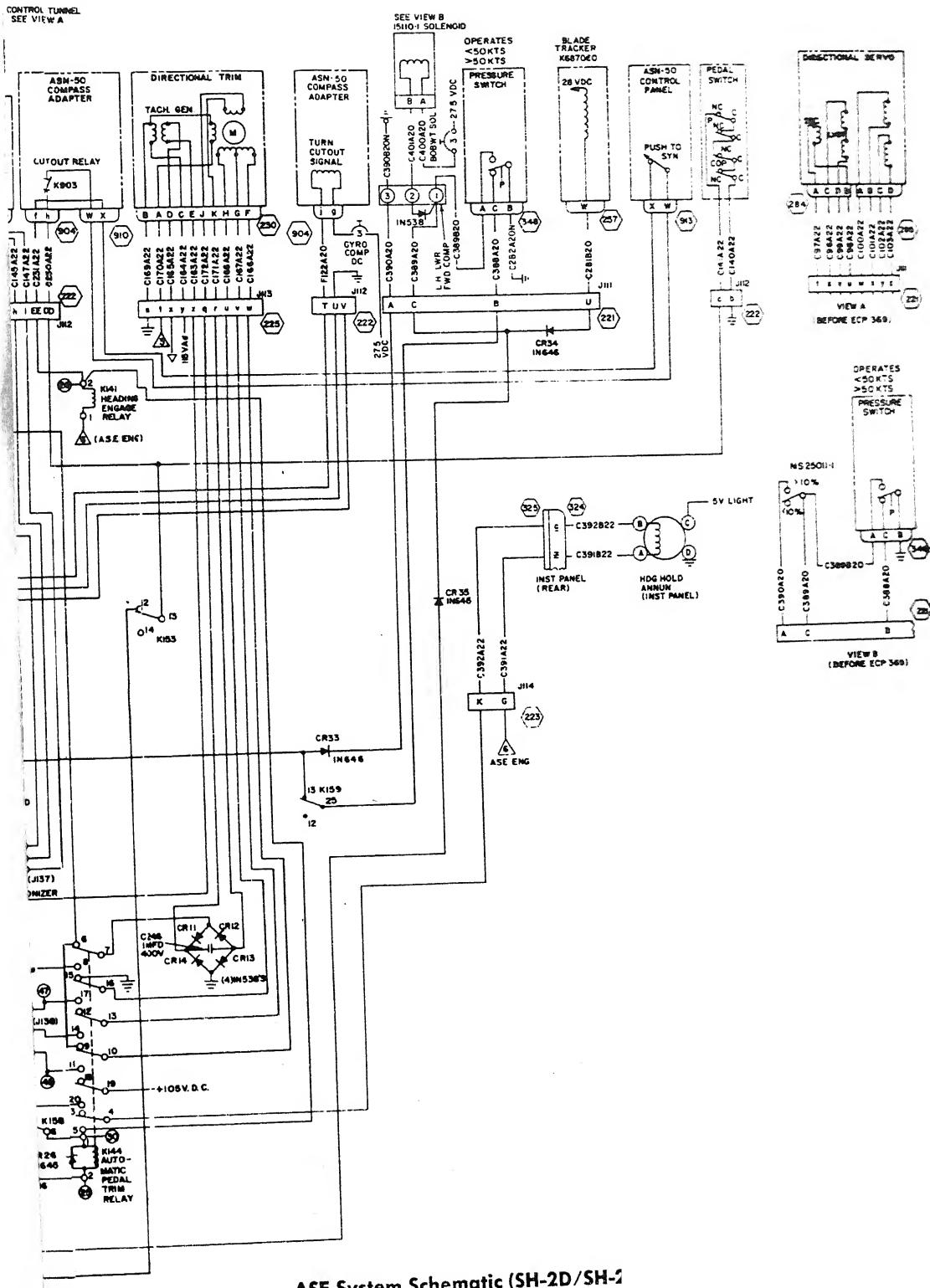
NOTE

The column labeled "checking for" can be used to pinpoint location of signal under test on the ASE system schematic, figure 1-12, page 1-26.

- d. Secure the test set and notify the instructor that you have completed the test.

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ASE System Schematic (SH-2D / SH-1)
After AFC 181 and ECP 369